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A STUDY OF THE LOGIC OF TEACHING. A REPORT ON THE FIRST PHASE OF A FIVE-YEAR RESEARCH PROJECT--THE LOGICAL STRUCTURE OF TEACHING AND THE DEVELOPMENT OF CRITICAL THINKING.

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THIS IS THE FIRST PHASE OF A 5-YEAR INVESTIGATION INTO THE LOGIC OF TEACHING THE SECONDARY SCHOOL. DUE TO THE UNSTRUCTURED NATURE OF CLASSROOM DISCOURSE, THIS STAGE OF THE INVESTIGATION IS CLASSIFICATORY AND DESCRIPTIVE. TOPICS COVERED INCLUDE (1) SCHOOLS, TEACHERS, AND RECORDINGS (SCHOOLS INVOLVED, SELECTION OF SUBJECT AREAS, ESTABLISHING RAPPORT WITH TEACHERS, RECORDS AND TRANSCRIPTIONS OF BACKGROUND MATERIAL), (2) THE UNIT OF CLASSROOM DISCOURSE, (3) CRITERIA FOR IDENTIFYING UNITS OF CLASSROOM DISCOURSE, (4) CLASSIFICATION OF EPISODES (ENTRIES AS THE BASE OF CLASSIFICATION, DEVELOPMENT OF CATEGORIES, KINDS OF ENTRIES, NOTES ON LOGIC OF CATEGORIES), (5) CRITERIA FOR CLASSIFYING ENTRIES, AND (6) ANALYSIS. (AF)

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A STUDY OF THE LOGIC OF TEACHING

A Report on the First Phase of a Five-Year Research Project

The Logical Structure of Teaching and the Development of Critical Thinking

The research reported herein was performed
pursuant to a contract with the United States Office of Education,
Department of Health, Education, and Welfare.

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PREFATORY NOTE

This is a report on the first phase of a five-year investigation into the logic of teaching in the secondary school. The two years of work covered by this report have been marked by trial and error, advances and retreats, happy thoughts that led down blind alleys, and a few moves that proved promising. There have been no beaten paths to follow, no neat research designs to adopt. For the raw data of classroom discourse are too varied, too overwhelming in their complexity, and too massive to cast into the well worn research models or the hoppers of statistics. They must first be classified, analyzed, and refined. Our search for the logical structure of teaching has therefore taken the form of a study in natural history. It is classificatory and naively descriptive. But we believe that this is a stage of investigation that must be worked through before we can understand teaching in its own right, rather than as a system of principles and practices supposedly derived from philosophy and psychology. The work described in this report is neither as rigorous nor as complete as we would have wished it to be. We are making it public at this stage of its development to fulfill our contractual obligations, and to fasten the work down while we seek to refine it and to move on into the next phase.

We wish to thank the schools and teachers who cooperated with us in this venture, and to express our gratitude to Professor Philip Lawrence, University of Canterbury, Christchurch, New Zealand, who worked with us during the first year and helped us over many a difficult point.

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CHAPTER I

INTRODUCTION

In this report we deal with the initial phase of a study of the logic of teaching, or perhaps it would be better to say the logico-psychology of teaching. Teaching has a logical dimension in whatever degree it involves questions of truth value--of whether statements are true or false, valid or invalid, etc. It has a logico-psychological dimension to the extent that teaching-learning operations have a structure capable of formalization by the procedures and techniques of logic.

1. Logic, Psychology, and Teaching

It is now widely held in pedagogical circles that teaching can ultimately be explained and controlled by psychological knowledge alone, and that logic is irrelevant to teaching. In the nineteenth century, before psychology became a science, and before the rise of the scientific study of education, no such view of the relation of logic to teaching was held. On the contrary, it was thought that logic described the mental processes involved in both learning and teaching. To DeGarmo, as well as to other Neo-Herbartians, Bacon, Mill, Jevons, Mach, and in ancient times Aristotle, had formulated in their logics the intellectual methods that led to efficient thought and dependable conclusions. It followed, according to their view, that if the teacher mastered the principles of both deductive and inductive logic, he would then be able to employ these effective methods as he instructs.

This view of the relation between logic and teaching was consistent with the belief of both logicians and psychologists as to the relation between logic and psychology. Logic was supposed to deal with the laws of the actual processes of thought, as well as with the normative laws of the mind. The laws of logic were the laws of thought. Pre-scientific psychology, coordinate with this view, assumed that the laws of logic were implicitly present in the operations of the mind. Logic and psychology were thus both in agreement as to the role of logic in dealing with mental processes. Hence a theory of teaching based upon logic incorporated also what were held to be sound principles of psychology.

As empirical methods of psychological study developed, the notion that logic dealt with actual mental processes came to be seen as gratuitous. For one thing, it became evident that ordinary verbal behavior bore little similarity to the formal logical structures which were the mainstay of logicians. For another thing, actual mental processes, whatever they might be, were unobservable. Hence the question of whether they were coordinate with logical forms remained at best an open question.

It was not surprising therefore that the young science of psychology swept away the whole argument as to the relation of logic to mental processes. At the very outset, empirical psychology reduced mental processes to sensations, images, associative mechanisms and the like. From these psychic elements it was no longer possible to construct a set of principles similar to those found in logic. Then, as experimental animal psychology replaced introspection, consideration of logical factors of intelligence were again swept aside along with the whole domain of cognition. In his epoch-making studies of animal intelligence, Thorndike eliminated the possibility of considering logical elements by reducing thinking and learning to a stimulus-response model. A response became connected to a stimulus by repeated temporal association of the two through trial and error, reinforced by success. Thinking was thus reduced to a series of stimulus-response actions occurring in accordance with the laws of readiness, exercise, and effect. And logic, as the science of thinking, was thus completely undercut.

At the same time that Thorndike and others were advancing experimental psychology, Dewey was reconstructing logic. Working in the context of the Darwinian model--environmental change, organic variation, selection, and survival--Dewey formulated the pattern of inquiry which incorporated both inductive and deductive logic as well as psychological facts. Instead of stimulus, he spoke of perplexing situation; instead of learned behavior, Dewey talked of resolved situation brought about by acting in accordance with an appropriate hypothesis. Between the perplexing situation and its resolution, Dewey put reflective thought. Thorndike, on the other hand, filled the gap between stimulus and response with neuron connections. Radical behaviorism excluded even the neurons and thereby eliminated the entire organism as a factor in behavior, reducing psychology to the study of objective conditions under which stimulus and response become associated.

In Dewey's view, logic is grounded in inquiry. The rules of successful inquiry are the rules of logic. And successful inquiry is inquiry which resolves perplexing situations. The rules of inquiry are derived by analyzing what is done as perplexing situations are worked out. When formulated, these rules are the norms by which to assess future inquiries. They may be disengaged from inquiry and studied in and of themselves, as in formal logic. Thus formalized, they are apt to lose their connection with inquiry and, in consequence, their normative role in reflective behavior. Teaching, in accord with this view, consists in guiding the learner through the process of discovery and verification.

From Dewey's theory of logic, educational psychologists derived the theory of problem solving, and Kilpatrick his project method of teaching. Both Kilpatrick and the psychologists ignored the normative aspects of Dewey's logical theory and emphasized its psychological elements. The theory of motivation, as well as the theory of learning which came to play a dominant role in educational thought, centered in this psychologized version of Dewey's theory of logic. Its central idea is that the individual is moved to act when he is in an unsettled situation--one for which he has no ready-made response. In such a situation, the individual is moved to try various ways of acting to overcome the barrier to his reaching a goal. By working himself out of such circumstances, he learns. Hence we find today an emphasis upon teaching by the problem method, by the method of discovery, and the like. In this pedagogical version of inquiry, there is no distinction between valid and invalid thinking, for such distinction cannot be made within a psychological analysis of problem solving.

Turning now to the question of teaching, we begin with the observation that whether or not logic is related to teaching is an empirical matter. It cannot be answered on a priori grounds. Teaching is a natural social phenomenon, related to the cultural survival of a people, as reproduction is related to their biological survival. Teaching has its own form, its own constituent elements, its own problems, and its own regularities. It takes place under a stable set of conditions--time limits, authority figures, limited ability of learners, institutional structures, etc. All these considerations support the conclusion that teaching is to be studied in its own right, if we would understand it and thereby gain greater control over it.

The foregoing conclusion is a point so obvious that it might go without saying, were it not for the fact that teaching has seldom been studied as a phenomenon on its own terms. Instead, theories about how teaching is to be done have been derived from philosophical and psychological ideas and imposed wholesale upon the processes and structures of teaching.

It is too early in the game of pedagogical research to say with certainty whether or not a workable theory of teaching can be derived from a theory of learning. But from a speculative standpoint, it would appear that efforts in this direction are apt to abort. Teaching is one thing and learning is quite another. And, it would seem, the gap between the two cannot be bridged by deductions from laws of learning. What has just been said is not to be understood as suggesting that theories of learning have no relevance whatever to teaching. Rather, the point is that the question of how and at what points in the act of teaching psychological knowledge is relevant would seem to wait for an answer upon the exploration of teaching as an independent phenomenon. When we better understand what teaching is, we can more wisely decide what is useful to it.

What has just been said about psychology applies with equal force to philosophy and to that branch of philosophy with which we are here concerned, namely, logic. Dewey and Kilpatrick, in their separate ways, no less than DeGarmo and others, imposed upon teaching their respective models--Dewey, the model of inquiry; Kilpatrick, a psychologized version of the pattern of inquiry; and DeGarmo, the deductive logic of Aristotle and the inductive logic of Mill. Dewey's conception of teaching and learning was grounded in his theory of logic. It did not represent a new approach to the problem of developing the strategies and tactics of teaching. For what he tried to do was to move from the stronghold of his new logic into the classroom. This is precisely what philosophers had tried to do throughout the history of education. Dewey's approach differed from those of the past only in the fact that a different interpretation of logic was to be applied to teaching.

As in the case of psychology, an answer to the question of what elements of logic are related to teaching depends upon a study of teaching itself. When the operations of teaching have been identified, classified, and analyzed, it may then be possible to tell how, if at all, logic is involved in teaching.

2. Logical Equivalence of Instructional Subjects

It is frequently held in educational theory that subjects of instruction do not differ in their logical demands, or else, if they do differ, the difference is inconsequential with respect to its effect upon the development of critical thinking abilities. This view is reflected in the widely held belief that methods of instruction determine the kind and rigor of intellectual habits that the student acquires. And it is further held that the problem-solving method of teaching and learning is superior to all other methods with respect to the development of the ability to think critically, as well as in other regards. That is to say, the ability to analyze an argument and to detect fallacies in reasoning, the ability to examine experimental evidence and to decide whether or not an empirical investigation has been properly conducted, or the ability to note valuations and to analyze and criticize their justifications--that all of these can be as well taught and learned in geometry as in English, in history as in physics. Either the subjects of instruction have no built-in logic, or such logic as they do embrace is the same from subject to subject. Thus the development of critical thinking abilities all depends, according to this view, upon whether or not the teacher uses the method of problem-solving and deliberately takes advantage of the opportunities to develop these abilities as they arise in the course of instruction.

The idea of logical equivalence of the subjects is in a sense a corollary of the notion that Dewey's pattern of inquiry adequately covers all reflective thinking. For the pattern of inquiry is supposed to include all the logical operations that the establishment of knowledge in any field requires. Since the pattern, on this view, is applicable to all domains of experience, and to all problems, it follows that it applies alike to all subjects of instruction. Of course, it can be maintained that the pattern as a form applies alike to all areas of experience, but that the detail operations within the formal model itself may vary from problem to problem and field to field. Thus the logical operations by which an hypothesis is tested in a physics course might not be precisely the same as those used in testing a proposition occurring in a history course. It appears that Dewey held some such view, since he did not consider all subjects as being logically equivalent. But this interpretation of Dewey's model of thinking has not been put forth in pedagogical discussion. On the contrary, his pattern of reflective activity has been interpreted in such a way as to reduce all subjects of instruction to the same order and level of logical rigor.

In a recent investigation[1] to find out whether or not instruction in the logic of certain content subjects--English, science, geometry, and social studies--would lead to improvement in the ability to think critically, we made the assumption of logical equivalence. But we were forced by the results of our study to question this assumption. In this investigation, teachers were found to vary widely with respect to results obtained by them, even when they teach the same principles of logical thinking under comparable circumstances. For example, two teachers, one in history and the other in physics, teaching comparable groups of students and dealing with the same principles of logic, were found to get quite different results with respect to improvement in critical thinking as measured by the ACE test of critical thinking. The results obtained by one teacher were negative; by the other, positive.

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[1] _The Teaching of Critical Thinking_, by B. Othanel Smith, Kenneth B. Henderson, et al. (To be published).

By hypothesis a number of variables may be associated with the differences in results obtained by teachers, as these are measured by student performance on tests. Among these variables, emotional climate and the sociometric structure of the classroom group might be considered. But our knowledge of the teaching situations led us to doubt that these factors were the significant ones. Intelligence was held constant by statistical techniques in the analysis of the data, and is consequently not believed to be a factor in accounting for differences in results. These differences may be due to variations in motivation. But our acquaintance with the students and teachers led us to question this possibility. Moreover, this factor would seem to cancel out partly because of the number of students and teachers involved in the investigation, and partly because of the fact that several courses used in the project were elective--in which it is supposed that students enroll because of their interest in them.

The facts of that investigation point to a totally different explanation of why some teachers are more successful than others in developing the critical thinking abilities of students. These facts point to the possibility that differences among teachers are due either to the differing degrees of rigor by which they carry on procedures which call into operation the higher mental processes, or else, to differences in logical operations built into the various subjects of instruction, or to both of these. Among these procedures are such typical classroom activities as defining, explaining, proving, justifying, and the like. These are logical in character, in the sense that we judge how well such procedures are carried on by reference to the rules of logic, semantics, and scientific method.

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When conflicting views with respect to the role of logic in teaching are considered, and when the further fact is held in mind that we do not know why some teachers succeed in developing critical thinking and others fail to do so, it is clear that we need more intimate knowledge of the actual operations of teaching than we now possess. In general terms, therefore, the questions we seek to answer by the present investigation are: First, what logical patterns, if any, are to be found in the verbal behavior of teachers and students? Second, are differences in teachers, as to the amount and direction of change in the logical thinking of their students, related to differences in the logical patterns these teachers employ?

The purpose of the present phase of our research is to explore the logic of teaching as exhibited in classroom discourse. More specifically, we propose to break such discourse into pedagogically significant units, and to classify them into logical categories. In the next phase of our work, we plan to instruct selected teachers in how to handle these logical structures (assuming there are such structures in teaching), and to measure the effects of such instruction upon classroom teaching and upon the critical thinking of students, as measured by appropriate tests.

CHAPTER II

SCHOOLS, TEACHERS, AND RECORDINGS

To study teaching from the standpoint of its logical structure it is necessary to have at one's command a full record of the didactic discourse of the classroom. We secured such a record by tape recordings of classroom discourse made under as normal conditions as possible. In this chapter, we describe how these recordings were made and the schools in which they were made. We also indicate the subjects and grade levels covered by the recordings.

1. The Schools

Because of the time and cost entailed in making and transcribing tape recordings, we were able to record the discourse of only seventeen classrooms, representing five schools in different communities. These schools were selected in two ways. Two of the schools had recently participated in a project on the improvement of critical thinking conducted under the auspices of the Illinois Curriculum Program. We were able to enlist their assistance in this project. The cooperation of the remaining three schools was secured, in accordance with University policy, through the Office of the Coordinator of Public School and University Articulation. This Office made contact with certain schools by letter and telephone. The letter described the project's purpose and then went on to give specific details as follows:

1. Each teacher should be selected from one of the four subject fields of English, Mathematics, Science, and Social Studies.

2. You would be asked to select the teachers on the basis of your own judgment of their competence as teachers. Teacher participation in this project would be voluntary, of course. Three out of the four teachers you select should be, in your judgment, teachers of high ability--in other words, from among the best teachers on your staff. The fourth teacher selected should be one of average competence in your judgment. If you object to selecting an average teacher, the fourth teacher also may be one of high ability.

3. Teachers whose classes are to be taped will be given the following facts about the recordings:

   (a) The teacher's work is merely to be observed and described. No evaluation whatsoever is to be made of any teacher's teaching or of the conduct of his or her classroom activities. This is a fact to be stressed, since some of the teachers might work under taping conditions with self-consciousness and tensions which knowledge of this fact would dispel.

   (b) Teachers, classes, and schools will remain anonymous on the tapes and on the verbatim transcriptions of these tapes, being identified thereon only by code letters and numbers. Only project staff members may listen to these tapes.

   (c) Individual teachers, schools, and cooperating officials will be officially and gratefully credited for their part in this research on the final report of this project when it is published.

   (d) To record a class session requires two individuals to handle equipment and to record the non-verbal context of the proceedings. The project staff has found that the presence of these individuals (graduate students on the project staff) has created no discernible disturbance or disruption of classroom activity. After the first day, their presence was generally taken for granted and the normal atmosphere of the class reasserted itself.

The letter then asks each superintendent for a different combination of good and average teachers of the various subject areas and grade levels.

We sought schools located in different sorts of communities, though we did not include communities in which the average expenditure per pupil was in the lower third of the schools of Illinois. The five public high schools finally selected differed significantly in a number of ways.

School A is located in a suburb which until recent years was composed almost exclusively of business and professional interests. However, the last few years have seen an increasing number of working class people moving into the larger and older houses which are being converted into multi-family dwellings. The school district includes a few light industries. The town has about 85,000 inhabitants. Table 2:1 shows that this school expends more per pupil than 97 per cent of the public high schools of Illinois.

School B is located in a suburban, residential, rapidly expanding community with a middle-class population in 1957 of about 60,000. It has a few light industries and is the national headquarters of a large insurance company. As shown in Table 2:1 below, this community spent an above-average amount of money per pupil: four hundred sixty-six dollars per child in average daily attendance. This is higher than 83 per cent of the public high schools of Illinois.

The district of school C includes a large Air Force Base which has several training courses for maintenance and plane crews. The town's population is estimated at about 25,000. Armed Forces families account for about half of the school population. There are no industries in the town. The school district includes some farm area. Its high school expenditure per pupil was about average for the State of Illinois.

School D is located in a rural town of 7,000. There are only one or two very small manufacturing plants in town. The school district covers a considerable rural area and the pupils are about equally divided between town and country. Its school expenditure per pupil was a little less than average for the State of Illinois.

School E is in an industrial and coal-mining city which has about 40,000 people. The school is, as in the other four cases, the only public high school in the school district. Its expenditure per child was slightly less than average for the State of Illinois.

Table 2:1. Average daily attendance and expenditure per pupil, 1953-1954*.

School	Average Daily Attendance	Expenditure per pupil in average daily attendance	Percentile Rank (Expenditure per pupil in average daily attendance)
A	2812	$636.00	97
B	2804	$466.00	83
C	453	$354.00	50**
D	550	$307.00	48**
E	1737	$302.00	48

* The latest figures available.
** These figures are estimates and are within 5 per cent of the correct ranking.

To sum up, these schools have a wide range of community backgrounds. One school is in a middle-class suburb; another school is attended largely by professional-class children. A third is located in an industrial town. Of the two schools which are in rural communities one has a large transient population. Two schools were significantly better supported financially than the other three: 97 and 83 percentiles against 50, 48 and 48 percentiles. In fact, the annual cost per pupil in School A was over twice as much as that of either School D or E.

2. Selection of Subject Areas

The question of the subjects in which to record class discussion, and at what grade levels, was answered in part by the purpose of our study and in part by what was available to us in the schools assisting us. Since we were studying the logic of teaching, it was to be expected that those subjects which emphasize didactic discourse and concept achievement would be most appropriate. This criterion ruled out subjects placing primary emphasis upon the development of skills such as those found in typing, physical education, and the like. In addition, we were interested in comparing the logic of teaching among the conventional content subjects such as history and science. This led us to eliminate those subjects sometimes referred to as vocational such as agriculture and home economics. The availability of subjects and teachers also restricted our choices. For example, it was necessary in one school to tape a physiology instead of a biology class. We had to omit the taping of tenth grade English altogether because the scheduled teacher wished to drop out when the procedures of recording were described. The subject fields finally chosen for recordings were English, mathematics, science, and social studies including history.

Since the logical operations involved in teaching may vary, either in form or detail, from one grade to another, it seemed desirable to distribute the recordings by grades as well as by subjects. We therefore decided to record the subjects for each of the four high school grades. The only exceptions were eleventh and twelfth grade mathematics. These were excluded because of the difficulty of recording the type of symbolic operations usually found in these courses. Our subsequent experience with the interpretation of recordings in ninth grade algebra justified this decision. As shown in Table 2:2, seventeen different teachers were recorded. All together we taped five consecutive class periods per teacher or a total of 85 class sessions.

Table 2:2. Summary of subjects and grade levels recorded.

	9th grade	10th grade	11th grade	12th grade	Totals
English	1		1	1	3
Mathematics	2*	1			3
Science	1**	1	2	1	5
History-Social Studies***	1	1	2	2	6
Totals	5	3	5	4	17

*The tapes for these classes could not be used because the amount of seat work rendered them unintelligible.
**The tapes for this class were inaudible.
***Including a class in sociology and one in a Core Program.

The question of how much of a teacher's classroom discourse to record, and whether to concentrate the recording in a brief period of time or to distribute it over a month, semester, or year, is one which we considered at some length. It could be argued that spot recordings over a semester or year would be more representative of a teacher's work than an equal number of recordings taken consecutively. It would appear that spot recordings would tend to cancel out the effects of variations of content within a course and of changes in style of teaching from one topic to another. These are very cogent reasons. Nevertheless, we decided to make five consecutive recordings per teacher. For one thing, such recordings would provide continuity in the teaching of a topic over a period of days. In this way, we would obtain the sort of context useful in a logical analysis. For another thing, consecutive recording is easier to schedule and less disruptive of school routine. These are major considerations when the cooperation of a public school is being sought. Moreover, consecutive recording is less costly in time and money, especially when the schools--as in the case of two with which we worked--are a considerable distance away.

3. Establishing Rapport with Teachers

The teachers whose classes were to be recorded were selected, as we have already indicated, by the superintendent or principal or both. Of course, this was not the case for the two schools which had been connected with the previous study of instruction in critical thinking. In these schools, the teachers were selected by the curriculum coordinator in consultation with a project staff member.

The validity of a recording depends upon the confidence of the teacher in those who make the recording and upon his understanding of the purposes and procedures of the taping. For this reason a meeting was arranged with the teachers selected in each school. The purposes and procedures of the project were thoroughly explained. We assured the teachers that the project was for scientific purposes only, that all tapes were to be treated anonymously, and that in no event would the classroom work of a teacher be evaluated. Furthermore, we stressed the importance of each teacher following his normal way of doing things during the recordings. We also endeavored to make clear to the teachers, as well as to the superintendent and principal, that no one should volunteer if being recorded would engender anxiety or otherwise bring about personal discomfort while teaching. Three teachers in two different schools decided not to proceed with the taping, although they had been selected by their administrators.

To further increase the chances of having classroom teaching as near normal as possible, we told the interested teachers that we wanted no more class preparation than they would ordinarily make, that they should teach the normal content in their accustomed manner, and in general to do whatever they normally do in the classroom.

As a further step to prevent modification of regular classroom procedures, we chose weeks which were unbroken by holidays or major school events. That pupils are usually ill-prepared for serious classroom work when a major athletic event is imminent is universally recognized. Also, we chose weeks which were not too near either end of the marking period. We did this to avoid class sessions which were merely introductory or which contained reviewing for major tests.

Another precaution was to have the teachers inform their classes during the week preceding the recordings that the class was to be recorded, explaining why the recordings were to be made. To further insure minimum disturbance we requested that the classrooms remain unaltered physically in any way.

Finally, when we arrived to take the recordings, we set up our equipment as quickly and as unobtrusively as possible. Our tapes did not have to be changed or stopped during class time. In most classes we were seated before the pupils got there.

4. Making a Record of Background Material

Still another problem was to secure a record of as much as possible of what occurs in the classroom. Tape recordings can reproduce only the sounds of the classroom. But often a facial expression, a gesture, pointing or nodding is essential to understanding the speaker exactly. We had no facilities for making a record of facial expressions and nods. However, we were able to make a record of gestures and pointings in some cases. In addition, a record was made of the physical contents and arrangement of the classroom, the size of the class, the materials used, etc. Finally, we found it advisable to note the causes of extra-verbal sounds such as footsteps and machines. All of these things were noted so that we might refer to these sources while making subsequent analyses of the classroom discourse.

To record these non-aural aspects a member of the project staff was seated in the back of the room with the machine operator. This observer secured the bibliographic data on all books used in class, the assignments given, and all materials used by students in preparing their reports as well as all dittoed material used in classroom discussion. The observer also made a record of bibliographic information on pictures used in class and on all audio-visual materials. Drawings were made of laboratory equipment used in experiments or demonstrations, and calculations and drawings made on the blackboard were also reproduced. Whenever possible, the observer noted the referent when anyone pointed to something in class discussion and did not name it, using instead the expressions "this", "that", "these", "those", "they", "it", etc. The seating arrangement and the position of other items in the classroom were noted, and in so far as possible the first names of the students and their positions in the room were listed in case future analyses were to find such factors to be important.

5. Making the Recordings and Transcriptions

The recording equipment consisted of a tape recorder running at 3-3/4 feet per second with a 7-inch reel of tape. We had a volume unit (VU") meter installed in place of the "recording level eye" in order to better control the lower volumes. A pair of headphones was also used for a direct aural check of the recording while it was being made. Three semi-directional microphones were used, each with its own adjustable stand. A felt pad to lessen the pickup of jarring noises was placed under each microphone stand. The three microphones fed into a microphone mixer which had individual volume controls and two amplification stages. This device enabled the person recording to turn on only the microphone closest to the person speaking. This did much to increase the intelligibility of the voice by decreasing background noise.

It was thought before the recordings were made that it would be sufficient for the purposes of analysis merely to listen to the recordings as they were played back. But it immediately became obvious that an adequate comprehension of the logical structure of the discussion could not be secured this way. Further, it was found that discussion of the details of the taped discourse was nearly impossible when only the tape itself and the observer's records were available for reference. And, in addition, it was found that comprehending the voices and what they were saying through a rather steady veil of noise caused by such things as chalk hitting the blackboard, persons walking, and the normal movement and whisperings of students was not achieved except through a great deal of concentration. This made it very difficult to think constructively about what was being said.

It thus was necessary to transcribe the tapes onto paper. Our technique was to listen and listen again, and to copy down accurately what we heard. Some words and phrases would be unintelligible to the transcriber. In such cases, he or she would try to make a guess at what was being said and would put the guess in brackets.

The transcriber's rough draft was gone over by a staff member who was actually present in the classroom at the time the recording was made. This individual audited the tape recordings, checking for accuracy and omissions, and trying to improve on or confirm the transcriber's guess in cases of borderline intelligibility. He also supplied the referents, whenever possible, for expressions referring to the blackboard, to demonstration materials, and the like, and referred the reader to the appropriate place in the observer's records where diagrams, charts, etc., were reproduced. In cases where the student or teacher quoted anything, the auditor would check the source and get the exact page number for the benefit of the analyst who might later need these things.

The completed transcriptions were put on ditto stencils. Anonymity was maintained with a coding system.

A number of conventions had to be devised for writing down the voices and sounds on the tapes. Dashes were used instead of commas wherever the speaker's pause or hesitation or voice tone did not conform to the punctuated form. The length of longer pauses was indicated in brackets. Where intonations or gestures carried the meaning, this was also indicated in brackets. Voice stress was indicated by underlining. If there was doubt about what the word or words were, they would be put in brackets and prefaced with a question mark, e.g. "[? cerebellum]".

The flow of discussion was divided on the page into utterances which were typed as paragraphs and numbered for convenient reference. (By an utterance we mean the record of the verbal behavior of one individual, at one point or another, in a verbal exchange with one or more individuals.) By breaking up the pages of transcripts in this way we facilitate our later analyses. The teachers' utterances were labeled with "T". Wherever possible the pupils' utterances were identified by first names; otherwise the symbols B (boy) and G (girl) were used.

CHAPTER III

THE UNIT OF CLASSROOM DISCOURSE

It seemed fairly clear to us that for the purposes of our project some kind of unit would have to be developed to serve as a means of breaking up and analyzing the mass and variety of verbal behavior contained in the transcripts of the discourse in classroom sessions.

In this chapter we shall first discuss briefly the requirements for such a unit. We shall then consider the basic patterns of the two standard forms of the unit we finally developed: the episode and the monologue.[1] The episode is a multi-speaker unit; it consists in the one or several exchanges which comprise a completed verbal transaction between two or more speakers. The monologue, a single-speaker unit, marks the "solo performance" of an individual addressing the group.

1. The Kind of Unit Needed

For the purposes of our project, the unit of classroom discourse would have to be something more than a means merely of chopping up a mass of data--say a twenty-page transcript of a forty-minute class session--into small bits. Such a unit would have to satisfy a number of requirements: it must have a low inference level, be logically analyzable, neutral with respect to subject matter content, and fairly reliable. These requirements may be stated more fully as follows.

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[1] For a more extensive treatment of this aspect of the work see M. J. Aschner, The Analysis of Classroom Discourse: A Method and Its Uses (Unpublished doctoral study, University of Illinois, 1959), Chapter III.

First of all, in order to ensure a low inference level, the unit had to be a simple behavioral one. That is, it must comprise items of readily observable behavior, behavior that can be described in simple, concrete terms; it must focus clearly upon what teachers and students do and say in their sessions of instruction, recitation, and discussion.

Secondly, these items of behavior must be analyzable in terms both of the logical aspects of teaching operations, and of the thinking reflected in the classroom performances of the students. In other words, the unit must enable us to examine those particular behaviors which it would be most relevant to analyze in our study of the logical dimensions of teaching.

Neutrality was still another requirement placed upon our unit of analysis. By a neutral unit is meant one that would take on the same general shape or "form" regardless of its "content". A unit marked out in a geometry class transcript should resemble a unit found in an English transcript. Episodes occurring in science class sessions should be no different in basic form from episodes in social studies class sessions. This generality of form is precisely the way in which a unit of classroom discourse must be neutral; for it thus provides the common basis, continuous from class-to-class, subject field to subject field, upon which comparisons can be made. Such a unit is capable of examination from any number of standpoints, and it is thus classifiable, as a unit, into any variety of categories. Upon this basis, comparative, quantitative and qualitative analyses can be made.

A final requirement set for our unit was that of reliability. That is, it had to be a kind of unit which, ideally, would permit any analyst trained to use our instrument to identify the same units in a given set of data that any other analyst, equally trained and using our instrument, would find independently in the same set of data. How well our unit meets this requirement will be reported in the following chapter.

2. The Unit of Discourse

This section contains a description of two basic forms of the unit: the episode and the monologue. An episode, it will be recalled, is defined as the one or several exchanges which comprise a completed verbal transaction between two or more speakers. The monologue, on the other hand, consists in the "solo" performance of a speaker addressing the group. Two basic patterns--and a mixture of these--are distinguished and examples of each of these are given.

Episodic discourse. In its normal course, a discussion in progress exhibits a characteristic movement. We often hear it described in metaphor as "ebb and flow", "give and take", "talking back and forth", etc. Even if we cannot understand the language being spoken, we can note this almost rhythmic cadence of speech and silence--or rise, forward surge, and subsidence. Over and over again, certain regular sequences of verbal interplay occur, falling into endlessly repeated patterns of action and responding action. We can sense a forward surge in the flow of talk, propelled by the familiar rising tones of a question or declaration. A spate of responding talk is thus launched, runs on, then tapers off. We can hear the ebb and drop in voice tones that presage a pause. We can note the familiar sound and gestures that seem to stem the flow of discussion with a final comment, or with the conventional nod of acknowledgment. Sometimes a brief silence intervenes, but just as often, another voice rises in further question or assertion; and again a stream of talk flows among the speakers, until once more it subsides or is cut off by the word or gesture that signals a closing. In this repeated rising surge, flow and momentary drop in the tides of conversation, episodes are formed, one following upon another.

The boundaries between episodes, in the series constituting a discussion, are traced in part by noting a number of conventionalized forms of speech and gesture which typify group verbal behavior. Certain standard forms of utterance are used, for example, to enjoin or invite immediate reply; other forms are conventionally understood to forestall or prohibit immediate response. A direct question, addressed either to a given person or to the group at large, conventionally demands some kind of responding action on the part of the individual or group addressed. A rhetorical question, on the other hand, is commonly understood to be uttered for its dramatic or rhetorical effect, e.g. during a monologue; although some do serve to trigger off discussion, reply is neither expected nor invited. When a reply is made to a direct question, it is also a convention that the reply itself be acknowledged in some way, at least by word or gesture if not by further responding commentary or questioning. These and other standardized and conventional forms of verbal behavior fall together into definite patterns in the course of a discussion.

We have encountered two basic patterns of verbal exchange in classroom discourse. The first basic pattern of exchange is called the reciprocating pattern. Here there is alternation between two speakers, of verbal sally and response, of the regular back and forth movement so aptly described as reciprocating action. The other basic pattern, called the coordinate pattern, is one in which each successive speaker responds more or less directly to the entry rather than to the remarks of the immediately preceding speaker; hence each remark following the entry is coordinate with all the others, with respect to that entry and to the remark closing the episode.

The following series of three episodes, reproduced from one of our classroom transcripts, illustrates the reciprocating pattern.[2] (In this excerpt, a broken line underscores in each episode the remark which serves to launch the verbal transaction embodied in the episode. We call remarks which function in this way entries. Paired diagonal lines have been placed as indicators for the breaking points between episodes.)

Teacher: Now who--do you know who was the first person who--uh--discovered the Hawaiian Islands? Steve?

Steve: Was it Captain Cook?

Teacher: That's right.// Do you know about what time it was, Steve?

Steve: Uh--sixteen seventy--something?

Teacher: No, it's not that early. Come down about a hundred years.

Steve: 1770?

Teacher: Yes. It was 1778, actually during the time of our American Revolution.// And do you know what he called the islands? They weren't Hawaii at the time. Anybody know? Oh, I think this is an easy name to remember--especially around noon. Steve?

Steve: Cook Islands?

Teacher: No. They weren't Cook Islands. [loud laughter from class] That's a good guess, but that doesn't happen to be it. The Sandwich Islands.

Steve: Oh. [more laughter]

Teacher: Do you eat sandwiches at noon, too?// Un--in--this particular period, the United States wasn't too interested. Of course

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[2] Taken from a United States History class, grade 11. Transcript C-21 #1, pp. 1-2.

> we were concerned with gaining our freedom from--uh--England at that particular time, but soon after that...... etc.

In her second utterance above, the teacher confirms Steve's reply to her original question and then proceeds to ask him a new question. Her confirming "That's right" closes the first episode; her new question is the entry which opens the second episode. This series closes with the teacher's humorous play on words, after which she launches into a lecture-type monologue.

It should be noted that the same two speakers carried on the three transactions illustrated above. Episodes are determined not by shifts in speakers but by shifts in what the speakers are talking about and by the speech forms and patterns of their dealings with the point under discussion. In the first episode, the point of concern was the identity of the discoverer of the Hawaiian Islands. The second episode focused upon a different point: the date of the discovery. When this question was settled, the teacher and Steve moved on, in the third episode, to the point concerning the name first given the Hawaiian Islands. In each case, their dealings with the current point went through a three-phase pattern: The point was raised in a question (opening phase); a reply was ventured and judged (sustaining phase); the exchanges were then either sustained further or dropped by the teacher's conventional affirming (closing) remark. Episodes vary in many ways from the simple archetype illustrated in the first of the three episodes above. Nevertheless, each episode stands as a discrete unit, as a completed verbal transaction.

Below is a typical example of an episode corresponding to the coordinate pattern. The point under discussion in this instance concerns the question of a novelist's use of his story as a medium for propaganda:[3]

Teacher: ...// All right, now, as Carol pointed out, Alan Paton is pleading for the alternative solution--That of brotherly love or peaceful co-existence between the races. Now, what do you think of a novelist who tries to preach a lesson or to--uh--promote his point of view through the medium of fiction?
[Pause, one second] You think of that. [pause, two seconds] Mary?

Mary: I was just going to say that I think it's the type of the novel. I mean it's the way that it is presented that moves us. He could present it in different ways if he wanted to. Not necessarily the [garbled two seconds] the novel or--uh--uh--oh, something that teaches you a moral lesson.

Teacher: All right, just as we discussed, it's a short story. Some stories do have a moral lesson to preach and then they become parables rather than just generalized short stories. And others simply are entertaining. Danny?

Danny: Well--uh--I think that more people would be interested in the fiction form of the novel than--uh--in just a pamphlet giving specific reasons why the two races should live together in brotherhood. I think it would attract more attention and be more interesting.

Judy: Well, since it's--When people read it, it's more parallel to everyday life. Uh--you might be able to understand it a lot better in a novel and so on. Otherwise you just see these facts and you wouldn't associate yourself and how you would feel and react to it.

Teacher: All right. //Well,--now, the chief function of any kind of fiction is to entertain, isn't it?
Uh,--do you feel that in this book, Cry the Beloved Country, the author is actually entertaining you? Barbara?

The entry which triggers off the episode reproduced above is the teacher's entry question: "Now, what do you think of a novelist....etc." Mary responds and the teacher acknowledges, "All right", adding a supplementary comment. Then Danny and Judy each respond to the point, one after the other. The teacher acknowledges their remarks without comment, proceeding then with a more or less rhetorical device to preface the next entry: her question about whether Alan Paton's novel entertains its readers.

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[3] From an English class, grade 11, transcript B-15 #1, p. 2.

A third, fairly common episodic form is shaped by a mixing of the reciprocating and coordinate patterns. That is, both the coordinate and reciprocating patterns of verbal interplay occur within the same episode. Below is an example of a mixed-pattern episode. The example is taken from the same English class we have observed earlier. Discussion is now concerned with some of the central characters in Alan Paton's *Cry, the Beloved Country*. The teacher is referring below to one of them, John Kumalo, an ardent proponent of black supremacy in Africa, as she says:[4]

Teacher: *What is his particular talent that is being used in this organization?* Mary?

Mary: His lion's voice?

Teacher: His lion's voice? Was that it?

Mary: Well--he had a real booming voice.

Teacher: Uh--Bill? [acknowledges a hand raised]

Bill: He had his--I was [garbled 2 seconds] I was thinking about when they--you know--get them all shook up or something like that and then they--[A boy breaks in: "Oh! I'm all shook up!" laughter from class] You know what I mean, well--you know like--well, I don't know how you explain to a--

Teacher: I know what you mean, but I can't say it.

Lydia: He had the power to agitate--to get people--to kind of--he appealed mostly to their emotions and he'd get them so far, then he'd just sort of--just some way--decide to--that they're hungry and some people would say [garbled 2-3 seconds] for food and he [one word lost] more and more and he got--putting into propositions the [inaudible 3-4 seconds] natural way [garble 2 seconds] keep them from doing it.

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[4] From transcript B-15 #1, pp. 10-11.

Teacher: Uh--at one point, isn't his voice called "Old Grundage"--isn't that one of the descriptions that Paton uses? And his particular talent of leadership of the group that he's working with--uh--is to be a --uh--impassioned speaker--you can just picture him on a street corner getting everybody all riled up.//Uh--Who else belonged to this leadership on the side of black supremacy, or rather on the side that--uh--if it were to win, were to lead to black supremacy? [calls on boy]

This mixed episode moves through several reciprocating exchanges between Mary and the teacher. Then Bill and Lydia join in, each responding to the entry rather than to what Mary said. Hence Bill's and Judy's remarks coordinate with Mary's with respect to the entry. The teacher closes off that point in the discussion with some elaborative comments and then launches a new episode with the entry question: "Who else belonged....etc.?"

It should be noted, incidentally, that episodes are not always brought through a final or closing phase, as are those presented here to illustrate typical episode form. Quite regularly one episode will be terminated without any explicitly closing comment or nod of assent; instead, the transaction is closed off tacitly by the advent of a new entry, that is, of a remark advancing some new point, which, in its own turn, touches off a spate of responding talk. There is nothing out of the ordinary about a discussion which proceeds through such a series of "truncated" episodes. They are merely one of the everyday phenomena of group verbal activity.

When these patterns of exchange break down--fail to take coherent form on the verbal record--and when no single speaker is doing all the talking--it is likely that the discussion itself has become disorganized and confused. This happens occasionally, and is worth noting. An example of a class discussion gone temporarily off the track appears below. This is another junior class in United States History, organized on a student-chairman basis. The teacher speaks nominally from the sidelines. Judy is chairing the day's proceedings. Just before this episode, the teacher, who moves in and out of the discussion at will, has closed off an episode by referring to Daniel Webster's famous pleas for a firm Union in the Webster-Hayne debate over whether an individual state could nullify an act of Congress or secede from the Union. The teacher then raises a new point with an entry question:[5]

Teacher: It was one that you, as a schoolboy in the 1800's, would have memorized word for word, and probably gotten up and declaimed it: "Our nation indivisible" and so forth and so on.//Well, how did nullification fit into that?

Judy: I'm still confused.

Les: Yes! I am, too!

Teacher: What about Marcia, there?

Jack: Wasn't it one of the Southern states again?

Teacher: Well, why don't we turn back to Marcia, here? She knows. [laughter]

Marcia: I don't how--how--

Teacher: Yes! [laughter]

Marcia: No! Jackson and Calhoun disagreed completely on this--and I don't know how it comes then--

Teacher: You were talking about a speech there when you were telling us about it first. Remember?

Marcia: Yes.

Teacher: Somebody threatened nullification or something like that. Do you recall that you brought that--[rest of question blotted out by voices in background]

Marcia: The debate from--[garble]

Teacher: Yes.

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[5] From transcript A-10 #3, pp. 11-12.

Marcia: South Carolina and Connecticut--uh--the senators from South Carolina--uh--threatened to leave the Union.

Teacher: If what?

Marcia: What?

Teacher: If what happened?

Marcia: I don't know. What do you mean, what happened--during the debate?

And so the confusion continues; Les, Jack, and Judy each break in with scattered comments, quite oblique to the point. Finally, after about three more minutes of chaos, the class settles down to orderly discussion. By tracing the patterns of exchange through this passage, the analyst is able to focus more sharply upon the progress (or lack of it) made in dealing with the original point raised by the teacher. Other forms of scattered discussion occur in which everybody talks at once and no one seems quite clearly to be speaking either to the point or to any other speaker.

Monologue discourse. The second form in which our units of classroom discourse may be identified on the transcripts embodies the alternate basic element of group verbal behavior: the "solo performance" of a speaker addressing the group. For an example of how monologue discourse typically occurs during class sessions, let us return to the U. S. history class that we observed in a discussion of the Hawaiian Islands. The teacher has been talking with Steve, it will be recalled. She turns from their play on words, signals (by the ubiquitous "Uh--") that she intends to continue speaking, and launches into the following monologue:[6]

Teacher: Do you eat sandwiches at noon, too?//Uh--in this particular period, the United States wasn't too interested. Of course we were concerned with gaining our freedom from--uh--England at that particular time, but soon after that we began to send people out around the world to trade and, of course, to stop at one of--many of them would stop at the Hawaiian Islands. The first people who went out there to settle, however, were not traders. Do you know what their interest was? Do you remember what their interest was? They went in 1820, the very first Americans in the islands--who settled in the islands. They were missionaries, and they were going out to try and christianize the--heathens. Then--uh--people, who were interested in--uh--trade and farming in particular, went into the islands, and their concern, of course, was the raising of sugar cane.

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[6] Transcript C-21 #1, p. 2.

And that brings us down into the period of history that we have been discussing more recently--when--uh--they were trying to make treaties which would make it possible for them to trade with the United States--particularly to get rid of their sugar in the United States. And the first trade treaty was made in the 1870's. It was a reciprocal trade treaty in which one particular product from Hawaii was to be admitted to the United States free. Uh--the product was, of course, the one which they had in greatest quantity at that time--sugar. In 1880, they renewed that treaty, and the United States got the right to use a particular coaling base--uh--coaling station there.//Now, do you have any idea which base we acquired in the 1880's--the use of which base? One that you should recognize. A very prominent part in the American defense system today. Tony?

Tony: Pearl Harbor?

Teacher: Pearl Harbor. That's right. And--uh--we have had a base there at Pearl Harbor, then, since 1880.//Now, how did the United States first become aware of the problem of...? etc.

The excerpt above stands as almost a classic example of a teacher's monologue discourse--in this case the didactic exposition of subject matter content. It is also quite typical of the way in which many teachers move from discussion to "lecture" and back to discussion again. Note how the word "Now" serves to signal the advent of something new, as this teacher shifts from lecture back to discussion with the entry question: "Now, do you have any idea which base...etc." And again, after her brief exchange with Tony, her "Now" signals a forward shift--this time into a new episode, with the entry question: "Now, how did the United States first....etc."

(By some kind of tacit convention, "Now", typically voiced in rising tone and volume, has become a standard alerting device, serving to signal listeners that a shift of some sort is at hand. Teachers and public speakers use "Now" regularly, and in two ways: to shift, as above, from lecture to discussion, and, in the case of extended monologue discourse, to signal the approach of some new turn in the topical content of the speech. This little word "now" thus serves the analyst as one of the recurrent verbal cues he may use in identifying breaking points between episodes, and between monologue units and the episodes adjacent to them on a transcript.)

Monologue discourse does not reveal any great regularity of pattern or phase-like qualities, as in the case of episodic interplay. However, expository monologues in progress often exhibit a kind of paragraph-to-paragraph movement. This is seen in the teacher's monologue above--indicated by an indent--as she shifts from the topic of early settlers of the Hawaiian Islands to that of trade treaties between the Hawaiian Islands and the United States. A solo speaker seems typically to move from point to point in his exposition, raising it, elaborating at some length, and then proceeding to some further point. It is useful in the analysis of classroom discourse to take note of these paragraph-like passages in a didactic monologue for the relation their contents may have to prior and subsequent class discussion.

Monologue discourse stands in sharp contrast to that carried on in the back-and-forth interplay of discussion or conversation. It is normally easy to distinguish a "solo performance" from that of the individual speaking--even at great length--in reply to a question asked him. This is so because both the occasion and the conduct of monologue discourse are more strictly and more explicitly delimited by convention than is the case with episodic discourse. Convention decrees not only how the individual shall speak: he addresses his words to the group at large and not to any one or few members of the group; it rules for the group as well: its members are an audience--silent listeners. It is conventionally understood that conversational exchange with the appointed speaker is neither expected nor invited. To address him, even in the courtesy of request and permission to speak, is normally perceived as an interruption, an intrusion. A monologue performance, like that carried on in an episode, is thus shaped by convention to stand as a discrete whole, a completed verbal transaction--in this case one undertaken between a speaker and a group. It is a transaction in the sense that speaker and audience are come together for a common purpose, that the group shall attend to what he says.

Certain types of monologue activity are characteristic of classroom discourse. The most common of these, of course, is the didactic or expository discourse of the teacher. However, in his role as leader and arbiter of class proceedings, the teacher also delivers, upon occasion, announcements, assignments, dictation material, and sometimes admonishments and moral preachments. Student monologues generally consist in such things as the presentation of assigned reports, recitations of memorized material, oral reading from text or blackboards, and so on.

Although there is variation among the classes taped on this project, monologues occur much less frequently than do episodes. This is to be expected, since monologue performances are quite normally reserved for special purposes and special occasions in group discussion proceedings.

CHAPTER IV

A SET OF CRITERIA FOR IDENTIFYING UNITS OF CLASSROOM DISCOURSE

The set of criteria used on this project for breaking classroom transcripts down into units of discourse will now be presented and discussed.[1] It consists, as we have said, in a set of descriptive statements about verbal behaviors that can be observed during class sessions. The types of verbal action described are those which typically initiate, sustain, and close off the sequences regularly observable in the classroom. These units comprise the episodes and monologues described and illustrated in the preceding chapter.

In order to sustain continuity with the material in the previous chapter, we shall begin this chapter with the criteria themselves. Then we shall give an account of the various avenues of approach we explored before arriving at the present set of criteria. Finally, we shall describe the procedures followed in the testing of the criteria for reliability, closing this chapter with a report on the results of these reliability tests.

1. The Form of the Present Set of Criteria

Without further discussion, we present here the set of descriptive criteria which we developed for use in marking classroom transcripts off into series of units.

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[1] For more extended discussion of this part of the work see M. J. Aschner, _The Analysis of Classroom Discourse: A Method and Its Uses_ (unpublished doctoral study, University of Illinois, 1959), Chapter V.

Analysis of Classroom Discourse

Classroom discourse may be analyzed into two kinds of units: episodes and monologues.

A. Discourse: All of the verbal behavior occurring during a class period.

B. Utterance: The complete record of the verbal behavior of one individual at one point or another within an episode. Exclamations such as "m-m" by the teacher, where concurrent with the student's verbal behavior, do not count as utterances.

C. An episode is a unit of discourse involving a verbal exchange between at least two individuals. It passes typically through three phases: (a) an initial or opening phase, (b) a sustained or continuing phase, and (c) a terminal or closing phase.

c:1 The initial or opening phase of an episode always contains a remark or set of remarks (assertions, questions, announcements, etc.) which is called an entry.

c:11 Remarks of other types may occur within the opening phase. These may function as introductory or prefatory to the entry.

c:2 The continuing phase of an episode contains remarks "launched" directly by the entry, or indirectly, by one or more remarks which were directly launched by the entry.

c:3 The terminal or closing phase of an episode may contain remarks designed either to supplement preceding remarks or to cut off the flow of discussion. In the absence of closing remarks, the terminus of an episode is marked only by the advent of verbal moves characteristic of the opening phase of a new episode.

D. A monologue is an extended unit of discourse spoken by an individual and which does not exhibit episodic form. In addition, the monologue differs from episodes in that no other speaker is involved in any sort of verbal exchange, except by intrusion or interruption.

Criteria for Identifying Episodes and Monologues

1. An entry consists of a remark or set of remarks (questions, assertions, etc.), signalizing that it will be followed by discussion, and setting the direction of that discussion.

1.1 The entry launches or advances the discussion in a new direction. An advance of discussion in a new direction is marked by:

1.11 A complete change in the topic or subject of discussion.

1.12 The introduction of a new aspect or part of a topic, subject, or argument of which one part was treated in a prior episode. This new aspect may have been mentioned in the initial or opening phase of a prior episode, but not be specifically taken up or developed in that episode.

1.121 Calling for further instances or cases of the topic or subject under discussion, except for simple enumeration of instances, shall count as an entry.

1.13 Returning to a point discussed in a prior episode and subsequently dropped, but to which the speaker now enlists or enjoins further discussion, shall count as an entry.

1.2 If a speaker advances a claim or raises a question or issue not being considered, and if he does so by invitation, consent, or simply on his own rather than on demand, his remark shall count as an entry.

1.3 If an entry statement is repeated after one or more episodes have intervened since the entry was first introduced, it shall count as an entry if it satisfies all other requirements for an entry.

1.4 A remark or set of remarks is said to be an abortive entry if it fails to elicit response even though it may satisfy all other entry requirements.

1.5 An entry does not engage the preceding speaker in clarifying or continuing what he just said. But it may be addressed to the preceding speaker, either directly or by implication.

1.6 An entry is not a statement that has been required, enjoined, or sought for by the preceding speaker.

2. The continuing phase of an episode is made up of remarks which are: (a) either replies or responses to questions; (b) claims, comments, or opinions; (c) questions which sustain the entry or point under discussion; and (d) anomalous questions.

2.1 A reply is a verbal move (remark) made in answer to a question that was addressed to the individual giving the answer.

2.2 A response is a verbal move (remark) made in answer to a question that was addressed at large rather than to a particular individual.

2.3 Claims, comments, or opinions addressed to the point under discussion in the episode are neither replies nor responses. They serve to sustain the flow of discussion.

2.4 Questions serve to sustain the continuing phase of an episode if they either direct attention to a prior question, or if they take up the point of a prior remark.

2.41 Questions which direct attention back to a prior question in the episode:

2.411 Replication: These questions repeat the entry question, or any other question, in the same words. They usually occur when the first rendering of a question was not heard or attended to.

2.412 Rephrasing: These questions repeat the point of the entry question, or of any other question, but in somewhat different words. These questions usually occur when a question was not understood or when the answer to the original question was unsatisfactory.

2.413 Reshaping: These questions go beyond rephrasing in that the content of the original question is somewhat altered. This alteration returns attention to the intent (purport) of the original question by pointing out an emphasis implied in the original formulation but which apparently needed explicit rendering.

2.42 Questions which develop or elaborate the point of a prior question or statement by:

2.421 Asking for amplification, clarification, information, evidence, or justification of what a speaker has said.

2.422 Asking or calling for personal opinion, preferences, or judgments directly concerning the point being considered. Such requests may be addressed either to an individual or to the group at large.

2.43 Anomalous questions:

2.431 Rhetorical: These are assertions in question form. They are usually made to invite agreement, to give information, or to elicit supplementary comments.

2.432 Designative: These are questions which have nothing to do with the content of discussion but rather with the designation of who should or may speak. An individual may be designated, or the question may be addressed at large.

2.433 Come-back signal: This is a question or a statement which has nothing to do with the content of discussion. It is used as a signal to the preceding speaker that his last remark was unintelligible, inaudible, or otherwise in need of restatement.

2.434 Review: These are questions which are asked to refresh one's memory about what was said earlier in the episode or even in a preceding episode.

3. An episode may pass through an overtly terminal phase or be closed off by the abrupt change of topic or subject which signals the opening of a new episode.

    3.1 The overtly closing phase of an episode includes remarks which serve expressly to cut off the flow of discussion. This cutting off may be effected by the repetition of the last statement of the continuing phase, or by such expression as "All right", "O.K.", etc.

    3.2 The close of an episode is often marked by the occurrence of supplementary or elaborate comments which serve to punctuate the current flow of discussion.

    3.3 In the absence of remarks expressly cutting off discussion or of supplementary comment, the episode is taken as terminated by the occurrence of remarks which signal the opening of a new episode.

4. A monologue, as a feature of classroom discourse, stands as a unit.

    4.1 It is marked by the introduction of one or more new topics or subjects, or of one or more new aspects of a topic or subject previously mentioned or discussed.

    4.2 The treatment of the materials introduced in monologue discourse is carried on entirely by a single speaker, and sustained by him without verbal exchange with other speakers, except in the event of intrusions or interruptions.

    4.3 As a unit of discourse, a monologue satisfies neither the criteria of being supplementary in the closing phase of an episode, nor of being prefatory in the opening phase; nor can it be counted as a feature of the continuing phase of an episode.

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It is doubtful whether the instrument in the form reproduced above would seem useful to anyone lacking the conceptual and technical background which it presupposes on the part of the analyst. However, it should be kept in mind that this form is one that was designed for use by a group of analysts who were already familiar with our conception of verbal behavior and already experienced in the study of classroom transcripts. By the time we arrived at the present set of criteria, for those who took part in its development, a common conceptual and procedural frame of reference had been attained. However, we felt that it was necessary to present here the set of criteria in the actual form in which it was tested and put to use.

Some features of the instrument in its present form should be noted. It begins with a brief list of definitions. Then it presents four groups of criteria. Each group is numbered, and each criterion has its own number within a group. All criteria of the number 1 group concern the identification of entry moves in episodes. Criteria in groups 2 and 3 cover the kind of remarks found in the sustaining and terminating phases of episodes. The fourth group of criteria is used to identify monologues.

In marking off a transcript, the analyst tags each utterance with one or more numbers from the set of criteria. This number represents his judgment concerning the identity of the particular remark or remarks made in the utterance. We have made it a matter of standard procedure, in the early applications of the instrument, always to affix the criterion numbers to the utterances of any transcript. This practice not only facilitated testing, since disagreements in judgment were thus quickly located; it also provided each analyst with some means to measure and maintain self-consistency in his own judgments.

It should be noted that we do not consider the present form of the instrument as final. Its formulation is still relatively crude at certain points, and could readily be refined and more succinctly worded. It is also likely that additions and revisions may be made in the continued application of the criteria to transcribed discussions. However, it is not likely that any set of criteria could be developed which would account for any and every item of verbal behavior that may occur in discussion. For language is as infinitely varied in its forms as the human activity of which it is a part.

2. The Development of the Present Set of Criteria

As might be expected, we were obliged to explore more than one line of approach before we arrived at the point of view leading to the construction of the present set of criteria. However, as we progressed from stage to stage in our thinking about how to develop a useful and reliable unit of classroom discourse, many of the insights and ideas which we rejected for one reason or another were not discarded but set aside for later use. Among these was the notion of the "sketch", which we shall describe in a later section.

As we took up the task of developing a unit of discourse, one of the first questions we considered was: Into what kinds of categories shall we eventually want to classify the different kinds of things that go on in discussion? Two general categories were suggested, one "cognitive", the other "non-cognitive". Within the so-called cognitive category we would classify such "logically structured" activities as: stating hypotheses, defining terms, evaluating, giving evidence, justifying a claim or an opinion, examining evidence, examining arguments, etc. In the "non-cognitive" category we might classify such activities as: giving directions, praising or reproving, routine class business activities (taking attendance, dictating assignments, etc.), jokes and irrelevant anecdotes, and the like.

After extended exploration of these and similar notions, we decided to set aside the "non-cognitive" question for the moment, and to see what results would come from attempting to classify the "cognitive" activities of a class discussion according to the following categories: Explanation, Term-Referent (defining), Proof, Justification (valuation), Maneuvering (teacher strategy), and others. "Others" was the place for everything that failed to fall into the first five categories on the list. Each member of the group then made an independent analysis of the same transcript, marking his own copy with the symbols E, T-R, Pr, Val, Man, and O. The results were chaotic; agreement between more than two or three of the six analysts over the category of a given utterance appeared to be more a matter of coincidence than of any common basis of judgment. And yet by this time we were becoming more clearly aware that our problem was one of achieving reliability in independent judgments; i.e., of developing some set of criteria, and a procedure for applying them, by which an individual could analyze a class discussion, doing so in such a way that another person, using the same criteria and the same procedure, would come up with the same results.

From this experience we learned many things. We learned first that one must be "purely descriptive" in classifying discussion activities. Thus we shed the stubborn preconception that an instance of verbal behavior can be classified in terms of the logical norms by which it is evaluated as logically sound, truthful, accurate, complete, etc. Of course, definitions, proofs, and explanations can be analyzed for their logical structure, and appraised for their logical soundness. But it seemed inappropriate for our purposes to impose these formal conceptual schemata outright upon the actual activities people carry on when they explain things, define terms, attempt to prove something. What does a person do when he explains? When did he begin, when did he stop, what did he do in the middle? These are the kind of questions that confronted us on the transcripts at every turn. As our experience with actual discussion increased, the questions multiplied. And, one by one, our rather rigid and formal preconceptions about "cognitive behavior" began to fall away.

At the same time, we began to recognize new dimensions in a persistent problem: How much weight do we accord to the literal "meaning" or content of an utterance, and how much do we assign to its role as a verbal act in discussion (such as a claim, a reply, a challenge, a guess) in deciding how to classify it? Is there a distinction to be drawn between what someone says and what he does in saying it? Thus, for example, in saying 'I am going to town', a person may be making a threat as well as stating his intentions. Whether he is making a threat or not depends upon the context, tone of voice, etc. When we explain something, what makes it an act of explaining--the fact that we are giving reasons to support a conclusion, or the particular set of words we say in giving reasons? Do we count the act of reason-giving as part of the explaining, or do we consider only some relation between the words stated in the reason and the words of the conclusion being defended? In observing the ways people actually do talk together, we began to see the pointlessness of distinguishing sharply between the act of answering a question and "the answer" which its wording presumably constituted. Yet at the same time, we kept encountering cases in which failure to give more weight to the verbal act or to the words of the act left us unable to decide whether or not a shift was taking place to another subject or point of discussion, or merely in the manner of treating the current one.

The next step in developing the present set of criteria consisted in exploring the idea of the sketch. This was suggested by Hempel's development of the conception of the "explanation sketch" in his analysis of historical explanation.[2] Hempel holds that historical explanations of human events, as constructed by historians, lack the completeness and the tight logical structure which characterize scientific explanations of physical phenomena. But this lack is due, he says, to incomplete knowledge and to the impossibility of experimenting with the past. Therefore, historical explanations should not be expected to do more than sketch in the picture of past events and the links here and there between them.

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[2] See Carl G. Hempel's article, "The Function of General Laws in History," in H. Feigl and W. Sellars, Editors, Readings in Philosophical Analysis, New York: Appleton-Century-Crofts, Inc., 1949.

Translating this notion over to the description of discourse seemed to suggest a way to mark off major blocks of discussion in terms of the "logical structure" of the activity being carried on, whether or not there would be any logical or formal "completeness" in the activity undertaken. Thus we could identify a series of utterances, perhaps covering two or three pages of a transcript, as an explanation sketch, or an evaluation sketch, even though no conclusion may have been actually stated, or even reached "implicitly" by the acknowledgment and acceptance of reasons or evidence given by discussants.

The result of this approach to analysis was the outline reproduced below. It appears in the revised, but still tentative, form which was constructed about six weeks after an earlier version had been formulated and worked over in successive staff meetings.

Identification and Analysis of Sketches

I. Sketches in Discourse

1. A sketch is typically a part of a body of discourse. It may consist of one or many utterances depending on the logical nature of the utterance or utterances.

2. The logical structure of the discourse within a sketch is constant. A change of logical form signifies the end of the sketch. [e.g., a change from defining to explaining.]

3. The subject of the discourse within the sketch may be any one of the following: material or social object, person, place, event, statement, etc.

II. Kinds of Sketches

1. The following kinds of sketches are conjectured: explanation, evaluation, term-referent, logical-proof, verification, information, direction, procedural. (It is anticipated that this list will be refined as discussions are analyzed.)

III. Description of the Various Kinds of Sketches

1. Explanation sketch

    a) The subject is typically a statement or event.

    b) The sketch contains a general proposition (descriptive), assumed or stated, which is used as an explanatory rule (principle, law, hypothesis) to account for the statement or event.

    c) The sketch contains evidential statements (the truth of which is usually taken for granted) which may be used to connect the subject to the general proposition.

2. Evaluation sketch

    a) The subject is typically a person, event, act, social or aesthetic object, etc.

    b) The sketch contains at least one normative principle, assumed or stated, and factual statements used as a reason for the rating given.

3. Term-referent sketch

    a) The subject is typically a verbal expression.

    b) The sketch contains statements which tell what an expression is used to refer to.

4. Logical-proof sketch

    a) The subject is a proposition.

    b) The sketch includes descriptive statements used as premises from which the proposition to be proved is derived.

    c) The sketch rarely presents a complete argument. Some of the premises are not stated.

5. Verification sketch

    a) The subject of the sketch is an observation statement which has reference to observables.

    b) The statement used as a subject is typically derived from other statements for which it is taken as evidence when verified.

    c) The sketch typically contains descriptions of variables--controlled and experimental.

6. Information sketch

    a) The subject of the sketch can be anything whatever.

    b) The content of the sketch consists of the narration of factual material which may serve the purpose of orienting or "setting the stage" for discussion.

7. Directive sketch

    a) The sketch contains statements which result in guiding the discussion toward a desired goal.

    b) Direction may be in the form of commands, questions, or suggestions.

8. Procedural sketch

    a) The subject of the sketch is the operation of classroom routine.

IV. Rules for Identifying and Analyzing Sketches

1. Sketches in general

    a) The beginning of a sketch can usually be identified by noticing certain language cues. For example, term-referent sketches typically start with a question such as: How do you define "......"?

    b) The language cue which introduces a new sketch is often a question which guides the discussion in such a way as to result in a logical structure different from that of the preceding sketch.

    c) Determine the logical character of the sketch by using the descriptions given in Part III.

2. Analyzing explanation and evaluation sketches

    a) Identify the principles (descriptive or normative) by the use of which the subject is either explained or rated. These principles may not be explicitly stated. In this case, formulate the principles from out of the content.

    b) Identify the factual statements which are offered as reasons for the explanation or the rating given to the subject.

    c) Reconstruct the discourse into logical form.

3. Analyzing a term-referent sketch

    a) Identify the expression or term to be explicated.

    b) Determine the type of definition developed in the discourse.

    c) Reconstruct the discourse into definitional form.

(others to be developed)

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In the weeks of work and discussion on the sketch analysis form reproduced above, several transcripts were studied and marked off into sketches. As usual, we would select a transcript, each staff member marking his own copy independently. Then we compared results. Some of these are worth noting. For example, it turned out frequently that as many as five out of six analysts would agree on the boundaries--the beginning and end--of a sketch. But then they would disagree sharply on what kind of a sketch it would be.

One such occasion arose over a sketch marked so that it began with the question, "Why did the Civil War not happen in 1829-30?"* Two analysts decided, on the basis of the form we used, that the discourse following this question was a directive sketch. They argued that the teacher was using this question and ensuing remarks to shape and direct the course of class discussion for that day. One person judged the same passage to be an information sketch. His reason: that this was an explanation sketch that never got going, hence the remarks were merely informative. Three other analysts claimed it was an explanation sketch, but then disagreed among themselves about what kind of explanation it represented. In similar cases there would be fairly high agreement--four to five out of six--among analysts as to the boundaries of a sketch, but disagreement over whether it was a case of evaluation or explanation, or some other kind of sketch.

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*From transcript A-10:I, #3, p. 5.

However, these disagreements were far less significant than the increasing number of agreements among us on marking off bodies of discourse. The following passage was marked off alike by all six analysts. We also agreed to call it a term-referent sketch.

T: ---What is the difference between nullification and secession? This is something that we should have at least asked, too, at the very beginning.

Judy: Nullification means to reject against something? Well, let's--

T: Well, don't look at me. Tell the group or get someone else to.

Judy: I'm not sure...Jack:

Jack: Nullification is when a state disobeys the Supreme Court but still remains part of the Union....

T: Secession.

Jack: Secession is leaving from the Union altogether.

T: Yes. (A-10:I, #3, p. 16)

The really interesting point here is that everyone ended this "sketch" after the teacher's "Yes", rather than after Jack's final remark on secession. Why include that last utterance? Well, came the several answers, it seemed to affirm Jack's definition, so it is part of the term-referent activity. Also, said others, it served to close off the sketch--in some way to punctuate it. This same passage was later marked as an episode.

During our work on sketches, we came more and more to mark their beginnings and endings in terms of what we called language cues. As a matter of fact, our agreements were beginning to depend on these recurrent, conventionally patterned features of the discourse, while our disagreements continued with respect to its "cognitive" character. This suggests that, whether or not we were aware of it, we were already analyzing discussion into units on some other basis than the one set forth in the form used in tracing out different types of sketches.

A linguistic behavioral approach to analysis. At about the same time we were getting under way in the search for sketches, the ideas for a new approach to analysis were presented to the group. It might be a good plan to analyze discussion from a linguistic standpoint, i.e., in terms of its own movements and contours, according to the natural units or segments which the observable ebb and flow of its progress seems to delineate. This could be done without regard to the "cognitive" or "non-cognitive" character of the activities taking place in discussion. Also, such an idea had a certain plausibility, since in marking off specific breaks between passages on the transcripts, we had been relying more and more upon language forms and patterns than upon the "logical" character of the discussion.

In addition, such units would seem to be "neutral". They seemed to shape up in similar patterns on every one of the transcripts. This would give us a common basis for comparing discussions from one class to another. Moreover, it seemed likely that we would then be able to analyze these units from more than one standpoint. We could develop a great variety of categories, each one with its own set of criteria; then we could classify these units and blocks of units in one way for a particular purpose, and in other ways for different purposes. We could study a chain of these units from the standpoint of the teacher's pedagogical strategies, for example. We could examine likewise the same units in terms of their "cognitive" type. We could classify them from yet another standpoint; according to how questions at different levels of abstraction and complexity are responded to by students; also we could classify them according to how teachers deal with these responses. Thus this approach would seem to be more versatile than the others we had tried. It might also give us a concrete, observable basis for a reliable set of descriptive criteria which we could use to mark off units on the transcript.

A new outlook on language was thus proposed and explored. Instead of considering primarily the content and purport of what teachers and students say, we began to look at each remark on a transcript as a verbal move--i.e., as an action performed in and through the use of language. The speaker in discussion, on this view, is an agent of a verbal action, much as a player on a games field is the agent of a play or series of plays as the game progresses. He may toss the "ball", receive it, pass it, run with it, etc. In the back and forth interplay of discussion, of course, the "ball" is the current point being dealt with among the speakers. A "play"--a verbal move on the part of a discussant--may thus be an entry question, a reply, an announcement, a closing remark, and so on, depending upon how the speaker is currently taking part in discussion.

Moreover, in this same "games" metaphor, a class discussion can be seen as an activity bounded by certain codes and ground-rules of play. There are "rules" (conventions) for how to ask a question, when to ask it, and even rules for who may ask what kinds of questions. Observance of these conventions of group discussion is not a matter of conscious conformance so much as it is an habitual way of behaving, a pattern of behavior acquired primarily through experience and social induction. And it is in the speakers' regular performance in accord with these ground-rules of discussion that the recurrent patterns of verbal performance and interplay are framed into the episodes and monologues we have earlier described.

The next step ahead lay in the development of a set of criteria and a procedure for marking the transcripts. If such a set of criteria turned out to be sufficiently reliable for our purposes, then we would have at last arrived at the kind of unit we were looking for. That is, it would be a simple, "behavioral" unit, identifiable in observation at a relatively low level of inference; it would be a versatile unit, permitting us to classify a given unit into a variety of categories, hence to view given instances of teacher-student interaction from a number of standpoints; and it would be a neutral unit--it would have general applicability to any transcribed class session, irrespective of subject field or grade level.

3. The Reliability of the Criteria

The type of reliability estimate we used to assess the dependability of our criteria was one based on percentage of agreement between independent judgments. The experimental phase of the determination of reliability involved obtaining independent judgments of the utterances on the transcripts. The statistical formula we used was a simple one involving the percentage of agreements out of the total number of units marked.

We felt that it was very important that a training procedure be followed with the judges to acquaint them with the type of data being dealt with and especially to clarify the conceptual framework within which the judgments were to be made.

Four staff members of the project were used to obtain the independent judgments required for the reliability test. These staff members had not participated in the development of the criteria.

The material used to train the judges consisted in actual transcripts of the class sessions. The two used the most were the first transcripts in both the eleventh-grade U. S. History (A-10) and eleventh-grade English (B-15) series, i.e., A-10, #1, B-15, #1. Tape A-10, #2 also was used to some extent.

The training procedure for the judges involved studying the criteria, marking the training transcripts individually, and discussing difficulties with the staff members who had developed the criteria.

The material used for the actual reliability estimates consisted of the seven remaining transcripts in the A-10 and B-15 series, i.e., A-10, #3; A-10, #4; A-10, #5; B-15, #2; B-15, #3; B-15, #4; and B-15, #5.

The first step of the final testing consisted in each of the four judges marking off independently what he judged to be the total set of units (both episodes and monologues) on each transcript. He numbered each verbal move on the transcript with the number of the criterion he thought it satisfied. The judges were to distinguish the greatest number of units which could result from the use of the criteria.

In the second step of the final testing, the four judges worked in two teams of two judges each. Within each team, the two judges together considered each verbal move in the light of the criteria and their original assessments of each move. After this step, many disagreements were eliminated; others persisted.

These combined results from each pair were used for the reliability estimates. (We felt that it was better to use the combined judgment of a pair of judges to estimate the reliability of the criteria because of the complexity of both the material in the transcripts and the criteria themselves. These factors tend to result in a number of "sheer oversights" and accidental skips in using the criteria, and can be reduced significantly by using pairs of judges to arrive at the units.) The formula we used for the reliability estimates is:

$$R = \frac{A_{xy}}{\text{Max } (E_x, E_y)} ,$$

where A_{xy} is the number of agreements between teams X and Y, Max (E_x, E_y) is the maximum value of the two teams E_x and E_y, E_x is the total number of episodes marked by team X, and E_y is the total number of episodes marked by team Y.

The reliability estimates obtained are presented in Table 4:1.

Table 4:1. Reliability estimates for the criteria, based on selected tapes from transcript series A-10 and B-15.

Series Number	Tape Number	Reliability Estimate
A-10	#3	.71
A-10	#4	.73
A-10	#5	.62
B-15	#2	.71
B-15	#3	.70
B-15	#4	.64
B-15	#5	.69

The estimates range from .62 to .73--a fairly small range--with a median of .70.

The disagreements seem to stem mostly from the ambiguity of the verbal moves. Because of the many subtle shadings and nuances in behavior, utterances are not clearly specifiable as fitting one criterion or another. One particular discrimination we have consistently had trouble with is in applying criteria 1.2 and 2.421, where the judge must distinguish between a new aspect of the same topic and a clarification or amplification of some point in the topic. We have been unable as yet to formulate a general and consistent rule to eliminate these difficulties. Another difficulty arises in distinguishing between long prefatory material and monologues.

CHAPTER V

CLASSIFICATION OF EPISODES

Episodes can be classified in a number of ways: by the nature of their content, by the number of verbal interactions they involve, by the psychological processes they entail, and so on. The purpose of this study requires that episodes be classified in terms of their logical features. In order to classify episodes in this way we must do two things. First, we must either invent categories, or else, use those which are found in the domain of logic. Second, we must work out criteria for deciding that a given episode belongs to a particular category. We shall treat the development of categories in this chapter, reserving the discussion of criteria for the next chapter.

1. Entries as the Base of Classification

It will be recalled that episodes are made up of three parts--an opening phase, a continuing phase, and a closing phase. As we began the task of working out a classificatory scheme for episodes, the question arose as to whether the entire episode or a particular part of it was to be considered. We could classify the opening phases and thereby group episodes by these phases. By the same token we could use either the continuing phase or the closing phase as the classificatory base. Or again, we could classify the episodes as such without regard to their parts.

Certain considerations led us to classify episodes by their opening phases. The opening phase always contains a verbal move which evokes at least one, but more often a series of related verbal exchanges. This verbal move is called an entry. It is always a self-initiating move on the part of the person who makes it and it is followed by responding remarks. The entry thus tends to shape the character of the episode. If the entry calls for the meaning of a word, the continuing phase is apt to consist of statements telling how the word in question is used. Likewise if the entry calls for an explanation of something, the continuing phase will likely emphasize some form of argument or description. The words "apt" and "likely" in the preceding sentences were deliberately chosen. It is not necessarily the case that the continuing phase will be consistent with the demands of the entry. The student may misunderstand the entry. He may not know how to respond and thereby fumble the verbal exchanges. Or for some other reason the student may fail to make an appropriate response. In any event, there is not always a close logical correspondence between what the entry calls for and what the body of the episode contains. For this reason, the entry is a more dependable cue to the purport of the episode than is the continuing phase of the unit.

Moreover, it will be of interest later to discover the extent to which discrepancies are allowed between what is demanded and what is supplied. Certain views of teaching emphasize permissiveness on the part of teachers. This view assumes that a permissive atmosphere encourages student initiative, discussion, and creativity. At the same time, precision in the handling of ideas and symbolic operations is prized. It is socially as well as pedagogically important to discover the relations between permissiveness and rigor in handling ideas. Were it to turn out that permissiveness and rigor of instruction are inversely related, readjustments in educational theory might well be called for. Now, the classification of episodes by entries would appear to facilitate the use of episodes in the study of teaching from this standpoint.

For one measure of permissiveness may be the extent to which the responding exchanges of the continuing phase are allowed to vary from the demands of the entries. Rigor of instruction, on the other hand, may be measured by the extent to which the handling of the body of the episode measures up to specified criteria of logic.

2. The Development of Categories

At the outset it seemed possible to select ready-made categories from among those found in general works on logic. If such selection were possible, the remaining task would consist of devising criteria and procedures for placing episodes in appropriate categories. However, it soon became clear that no such simple solution was possible. The great variety and complexity of symbolic operations demanded by teachers made it quite clear that episodes could not be neatly fitted into ready-made classes. It was necessary to follow a more empirical procedure--to work out categories in terms of the nature of the entries themselves. Of course, conventional categories of logic such as definition, designation, and classification have been constantly referred to in our deliberations and some of them appear in our list of categories. This is necessarily the case. To ignore such categories would be to invent a new logic, and that task is not within our domain. But the occurrence of these categories in our list resulted from study of the entries themselves rather than from a priori decisions.

One effort to formulate categories empirically was focussed upon an analysis of the verbs contained in the entries. It seemed likely that the nature of the main verb would be a clue to the logical demands of the entry. The entry 'What is the bigger part of the brain called?' contains the verbal expression "is----called". Entries containing such expressions would seem to fall into a logical category of term-referent where the referent is given and the name of it is called for. Again, the expression "do----differ" appearing in the entry 'How do the eyes of the fish differ from the eyes of the invertebrates that we have been talking about?' seems to indicate clearly that this entry requires some sort of discrimination, a pointing out of the differences between the eyes of the two sets of animals. Altogether we found that there were at least thirty-six different types of verbs used in the entries. For example, there were verbs such as "know" and "think" which indicate degrees of belief; verbal expressions such as "turn into" and "convert" which express simple change; others called for the grouping of things, for quantitative values, outcomes of actions, and so on. Promising as this approach appeared to be, it became clear on further analysis that identical verbs occur in questions of quite different logical import. Consider two entries as a case in point: 'What did they decide about the income tax?' and 'Why did you decide on angrily as a modifier in a sentence?'. Both of these entries contain the expression "did----decide". Yet the first entry asks for a statement of a decision while the second one asks for an explanation as to the use of the word "angrily". The number of entries containing the same type of verb or even the same verb, and yet varying in logical significance, rendered this approach to the formation of categories ineffective.

A second effort to derive categories empirically consisted in a study of the nouns appearing in entries. It seemed reasonable to suppose that the nature of the nouns would give definite clues to the logical operations required by the entries. For example, the entry 'What is a neuron?' is seen to be quite different from the entry 'What is a felony?' when the nouns "neuron" and "felony" are taken into account. A neuron is a physical object, i.e., it occupies space and in principle is observable. A neuron as an object can be pointed to or described. But a felony is a status ascribed to acts. Acts such as killing, if they occur under certain conditions, are judged to be murder and murder is a felony. Now killing may be witnessed. It is an observable act. But strictly speaking murder is not observable. For whether killing is murder or not is a matter of decision, usually by a court of law, and not a matter of observation.

Consider also the entry 'What are some characteristics of his writing that you have noticed?'. The central feature of this entry seems to be the term "characteristics". Whatever they are, some of them must be designated in order to respond satisfactorily to the entry. Yet what sort of term are we dealing with? Is it the same sort as "neuron" or "felony"? "Characteristics" is a term of great generality. In its widest scope, it is the name of the class of all properties. It denotes a class of terms any member of which may denote the properties of an object. Thus the writing of a given novelist may have a number of properties. It may exhibit a large proportion of metaphors, or great descriptive detail, or lyrical expressions, and so on. Each of these is a property of the writing and is a member of the class of things called characteristics. But the class is not exhausted by the properties of writing, for all properties of all things belong in the class of characteristics. The terms "relationship" and "difference", frequently used in entries, are similar to "characteristics" with regard to generality.

It follows from the foregoing discussion that nouns may be grouped into sets by levels of abstraction as well as by what they denote. We developed five major sets of nouns based upon the character of their referents and the magnitude of their referential distances.

But, as in the case of our study of verbs, this approach to logical categories had to be abandoned. In the first place, the study of nouns gave no direct clues to logical categories into which entries might be placed. Logical operations, except for definition and classification, are independent of the nouns contained in propositions. This is precisely what one would expect. To deal with nouns, in the foregoing sense, is to analyze a concept. For a noun is the name of a particular object or of a concept, that is, a class of objects. And there is more to logic than the analysis of concepts. Moreover, the logical demands of instructional activities far exceed those made by entries calling for definition and classification. In the second place, to distinguish among nouns in logically significant ways is to engage in concept analysis at levels of high abstraction. The inference chain leading from these levels back to the entries themselves is often long and tenuous. For this reason, classification of entries in terms of types of nouns, even were they logically significant, would be of doubtful use.

Another effort to build categories empirically led us to look at the stems of entries. At the very outset of our efforts to classify entries it became desirable to group them for convenient handling and easy reference. This led to the use of entry stems as a basis of convenient classification. Ordinarily we use "stem" to refer to the opening words of the entry. Some entries could not be usefully grouped by the opening words, however, and in these cases the stem refers to other parts--usually the verbs or verb phrases--of the entry. The following is the way the entries were thus classified:

1. Verb stems--Can....? Do....? Have....? Is....? Will....? Would....? Let us (with a verb--have, look, see, etc.).
2. Adjective stems--What....? When....? Where....? Which....? Who....?
3. Adverb stems--How....? Why....?

4. Conjunction stems--If....? What (when, how, where, etc.)....?
5. Miscellaneous--Agreement asking (e.g.'That's the central government of Canada, isn't it?'); Completion (e.g.'Our conclusion is?'); Complete Declarative (e.g.'This is considered his best novel.'); Imperative (e.g.'Name some words that are negatives.'); Incomplete (e.g.'For what reason (two sides equal)?').

These stems afford only a limited clue to logical categories. The "Why....?" and "How....?" stems, due to their limited linguistic function, are frequently associated with entries that demand causes, motives, purposes, ways and means of doing something, and the like. Likewise "If....,....?" stems are almost always found in entries calling for conditional reasoning. But often stems are more varied with respect to the demands made by their entries. For example, "What....?" stems are to be found in entries asking for all sorts of logical responses, as shown in the following entries: 'What is a rhombus?' 'What is the valence of hydrogen?' 'What kind of structure is the dendron?' 'What equation relates these quantities?' 'What would the nervous system correspond to in a building?' 'What causes warts?'. The first of these entries asks for a unique description of a rhombus. The second one demands that a numerical constant be specified. The third entry requires that the dendron be classified by its structure. The next entry calls for the statement of an equation. The next one demands that something about a building that stands in an analogous relation to the nervous system be named. The last of the entries asks that an explanation be given. Yet all these different functions are served by entries having "What....?" stems. The same sort of variation can be shown, in differing degrees, for other stems. Even the "How...?" and "Why....?" stems vary in this regard to some extent. 'How would you define crime?' is logically quite a different entry from 'How would you identify an acid?'. The first of these is not asking for an account of the procedure by which the word "crime" is defined. Rather it asks that the word be defined. Furthermore, this entry could be understood as asking for a definition of the word "crime" as used by the person addressed instead of for a dictionary or textbook definition. The second of these entries calls for a procedure by which acids are identified. But, as in the preceding case, the question could be interpreted as asking for the particular procedure used by the person addressed. Because of these variations in the logical demands of entries having the same stem the development of categories by reference to stems did not seem promising.

While the three approaches to the development of logical categories just described failed to yield the desired results, they were not without value. They afforded information about entries which proved to be useful as we turned to the development of criteria, a subject to be treated in the next chapter. Moreover, from these approaches we gained a familiarity with certain aspects of entries which reinforced the more intuitive formation of categories to which we now appealed.

As we began to examine a sample set of entries, and to look at each entry as a whole, we soon became aware of the fact that the logical character of an entry could be decided by reference to the sort of response it demands. When we speak of response, we of course do not mean the actual response, that is, the response which the student made and which can be found by examining the continuing phase of the episode. It will be recalled that this response was eliminated at the outset as a basis for classifying episodes. It was ruled out because of discrepancies which sometimes occur between the demand of an entry and the character of the response. What we appeal to is therefore not the actual response but an idealized response. Such a response is a schema. That is to say, it is a form to which responses to the members of a given class of entries would conform, regardless of the content with which entries deal, were the entries unambiguous and the responses logically correct.

The meaning of an idealized response may be further clarified by reference to examples of entries. The entry 'From which state did Mark Hanna come?' demands that a particular political unit be specified. It is not necessary that we know the state from which he came in order to know that the entry requires as an appropriate response that a particular state be indicated. Nor do we need to know the time at which he came from the particular state. Were we asked to give an actual rather than an ideal response, we would want the ambiguity removed from the entry by specifying the time. Mark Hanna might have come from New York, or anyone of a number of states, depending upon the occasion. In the sense of nativity he could have come from one and only one state. Furthermore, an idealized response may be made in more than one way. In the present case the particular state could be specified by naming it, by pointing to it on a map, or by sketching its shape, and so on. 'Which line is the base of the triangle?' is an entry which likewise requires that a particular something, namely a line, be specified. 'What is the word (in the sentence) that is to be modified?' similarly requires that something--a word--be singled out. We can now generalize what we have been doing and say that there is a set of entries which demands as a response schema that particular things be specified by naming or by pointing.

In contrast to the foregoing entries are cases in which no particular thing is called for. In the entry 'What is some food material that the fish could use?' it is clear that food material is to be indicated. But the phrase "some food material" is a variable. The entry therefore does not demand that a specific food item be indicated. Anyone of a number of foods could be named each of which would satisfy the demands of the entry equally well. In these cases the response schema consists in naming or otherwise indicating any one of a number of values of the variables satisfying the function of the entry.

Some entries demand more complex response schemata. 'How did McKinley happen to be killed?' requires that a sequence of events leading up to and ending in McKinley's death be related. 'How did they finally relieve this beleaguered garrison?' is an entry which also demands recounting of a chain of events ending in the relief of the garrison. A similar response is to be made to the entry 'In the East, what had Cleveland done that made the Capitalist unhappy?'. Here the response consists in narrating the acts of Cleveland that led to dissatisifaction among the financial leaders. Thus we have a response schema which consists in the narration of a sequence of events leading up to and culminating in some particular state of affairs. This state of affairs is said to be the result or outcome of the events, and the events are said to explain or to account for the outcome. Again, it is not necessary that we know what the actual events were in order to tell that an entry demands the narration of events as a response.

3. Kinds of Entries

The foregoing discussion is perhaps sufficient to indicate the way in which we arrived at a set of logical categories. Without any further ado we will now list the categories into which the entries were grouped.

1. Defining. Entries making up this group are concerned with how words or other symbols are used to refer to objects (abstract or concrete). These entries vary in form and content, but in general they ask implicitly or explicitly for the meaning of terms.

In some cases, a term is given and a definition or meaning of the term is to be supplied as a response to the entry. In the example, 'What does the word "dorsal" mean?' the question requires that whatever is designated by "dorsal" be indicated.

In other cases, neither the word "mean" nor "define" occurs in the entry. Rather the entry asks what something is, for example, 'What is a cablegram?'. These entries require that the noun appearing in the question be defined, or that the referent of the noun be described.

In a few cases, the noun in the entry is a grammatically proper name. In these cases, the entry requires that the object designated by the proper name be described or otherwise indicated. For example, 'Who was Paul Elmer More?' is a question which asks that the person referred to be described unambiguously.

Finally, some entries ask for a term or expression that can be substituted for another term or expression, for example, 'What is the symbol for gravity?'.

2. Describing. To describe is to represent something by words or drawing, to tell about something. Thus the entries making up this category mention or suggest something and require that an account of this something be given. In the question 'What can you tell us about the gill rakers?' it is clear that we are asked to describe the gill rakers.

However, not all questions which mention or allude to something ask for a description. For example, 'What would be some examples of a sense organ?' is a question which names a class of things and asks that instances of it be cited. No description is called for.

In some cases, as in the example just given, it is easy to tell whether the entry requires a description or an identification. But in a large number of entries the intent of the entry in this regard is obscure. 'What did Cleveland find out?' is a question which might be answered by naming whatever it was that Cleveland uncovered. But our expectations would be more nearly satisfied were the question answered by a brief account of what he found out. On the other hand, 'What is a common defect of this part (cerebellum) of the brain?' can plainly be answered by naming the defect. But a description of the defect would not be inappropriate as an answer.

3. Designating. To designate is to identify something by name--word or other symbol. The name designates the object (abstract or concrete) to which it refers. Thus this group of entries is made up of items in which something is described or otherwise indicated, and the name used to refer to it or to identify it is asked for. These entries vary widely in form and content. In general, they demand that objects (abstract or concrete) be designated by name or other symbol, or simply by pointing. Consider the question 'What do you call a word used to modify a verb?'. The question is answered by giving the name of the word, namely, "adverb". The question 'What reptile did he show in the film?' is answered in the same way--by giving a name--although the question does not explicitly ask what the reptile is called. Again, 'What is the word (in a given sentence) that's to be modified?' is a question which can be answered by pointing to the particular word or by saying it.

Designating may take the following forms.

3.1 The entry demands that an example or instance, or a number of examples of a group of things be named.

3.2 The entry gives a set of things and it requires that all members of the set be named.

3.3 The entry gives a particular class or group of things, or a particular object, and requires that it be specified by name or by pointing.

3.4 The entry describes or suggests something and asks explicitly for its name or for what it is called.

4. Stating. Entries in this group do not ask for names, descriptions, etc., but for things to be stated. They may ask for statements of issues, steps in proofs, rules, obligations, theorems, conclusions, ideas, beliefs, promises, threats, etc. For example, the question 'What is the conclusion?' asks for a statement of some sort. It can seldom be answered satisfactorily merely by naming.

5. Reporting. The entries in this group ask for a report on what a book or document says, for information in the text, or for a summary or review, and the like.

6. Substituting. The entries making up this category ask the student to perform a symbolic operation usually of a mathematical nature.

7. Valuating. To engage in valuating is to estimate the worth, dependability, etc., of something. An entry of this type requires that some object, expression, event, action, or state of affairs be rated as to its value, dependability, desirability, and the like. For example, the question 'Is he a good judge?' asks the student to rate a judge who acts in some particular manner.

8. Opining. To opine is to express beliefs, usually based on little or no evidence. Such beliefs are about what is possible, what might have been and is not, what might obtain in the future, or the like. 'Do you think that historians will say that Wilson was right in proposing the League of Nations?' is an entry which asks for a conjecture about how historians of the future will judge Woodrow Wilson with respect to a particular set of actions--those involved in proposing the League of Nations.

9. Classifying. Each entry in this group makes explicit reference to an instance or class (type, sort, group, set, kind) of things or both. The

entry requires that a given instance be put in the class to which it belongs, or that a given class be placed in a larger class to which it belongs as a subclass. For example, 'What special type of triangle did you find it to be?' is a question which makes reference by the word "it" to a particular triangle. The student is expected to tell what class of triangles this particular one belongs to. As an illustration of questions which ask that a class be placed in a larger class, consider the following: 'What group of animals does the jellyfish belong to?'. In this question, the term "jellyfish" does not refer to a particular jellyfish but to a subclass. The student is required to name the larger class to which the group of animals called "jellyfish" belongs.

10. Comparing and Contrasting. This type of entry requires that two or more things--actions, factors, objects, processes, etc.--be compared. In some cases, the entry specifies two or more things, and asks that either their similarities or differences be noted with respect to a particular characteristic. The question 'What's the difference between probation and parole?' illustrates the first of these cases. The student is asked merely to make a comparison, the points of comparison not being explicitly indicated. The second case is illustrated by the question, 'Is his (fish's) eye very large compared to the size of the grasshopper's?' Here the eyes of the two different animals are to be compared with respect to size only.

In still other cases, the entry names a thing and requires that another thing similar to it, or different from it, be indicated. Consider the question 'Which one (Canadian house) corresponds to the House of Commons?'. The House of Commons is the given object. The question asks that the Canadian house most like it be named. Entries of this kind do not require that differences or similarities be explicitly stated. The student considers the differences or likenesses and selects the object in terms of them, as required by the entry.

11. Conditional Inferring. This category consists of entries each of which contains an antecedent, that is, the conditional part of a statement. In the sentence'When it rains, the streets are wet', the phrase "When it rains" is the antecedent. The phrase "The streets are wet" is the consequent. Now, the entries which make up this category give an antecedent. Sometimes they give both an antecedent and a consequent. But they never contain a consequent alone.

Here is an example of an entry containing an antecedent only: 'How does that (undemocratic handling of colonies) affect the mother country?' The phrase "undemocratic handling of colonies" is the antecedent. It describes the condition of which the effect on the mother country is the consequent. The question asks the student to tell what the consequent is. Take another case: 'If that diagonal (in rhombus) is given as 12 and this angle is 60, what is the angle at C and at A?'. The antecedent is 'If that diagonal (in rhombus) is given as 12 and this angle is 60'. The consequent asked for by the question is "What is the size of the angle at C and at A?". In all cases where the antecedent alone is given, the entry requires that the consequent--effect, result, outcome, subsequent behavior--be supplied as the answer.

Consider an example of an entry containing both an antecedent and a consequent: 'Did you ever get a headache from sleeping in a draft?'. The phrase "sleeping in a draft" is the antecedent, and "get a headache" is the consequent. Now, in entries of this sort, the student is required to affirm the consequent, to deny it, or to say he does not know whether he has ever suffered or enjoyed the consequent under the given condition or not.

Some of these entries asks for value judgments, some ask for statements of result or outcome, and others for descriptions of actions, decisions, and the like.

12. Explaining. There are several types of explanation entries but they all have one thing in common. They give a particular consequent and they require that an antecedent be supplied. To explain is to set forth an antecedent condition of which the particular event to be explained is taken as the effect, or else, to give the rules, definitions, or facts which are used to justify decisions, judgments, actions, etc. In the example 'Why did the light go out?', the consequent is "the light go out". The question asks the student to give a reason or reasons to account for the fact that the light is out. The reason(s) is the antecedent.

There are six kinds of explanation entries, depending upon the sort of antecedent used to account for the consequent. They are mechanical, causal, sequent, procedural, teleological, and normative. These are described as follows:

12.1 Mechanical Explaining. This type of entry gives an event or action which is to be accounted for by describing the way the parts of a structure fit or work together. A sample entry will help to make this category clear: 'How (do fish make a sound)?' The action to be accounted for is "fish make a sound". Now, the antecedent consists of some kind of structure which enables the fish to make vibrations. A description of this mechanism would constitute an answer to the entry.

12.2 Causal Explaining. Entries of this type give events, situations, or states to be accounted for and ask that a state of affairs be cited of which the given event (or situation or state) is taken to be the result. Consider the example: 'What makes a person's muscles sort of twitch-like?'. The event to be explained is the twitching of a person's muscles. The explanation consists of a description of the condition of the nerves associated with the twitching.

12.3 Sequent Explaining. Entries of this sort ask how something happened. They require that a sequence of events be cited of which the event to be accounted for is the sequel. For example, the question, 'How did McKinley happen to be killed?' requires the recitation of the events leading up to the assassination of President McKinley.

12.4 Procedural Explaining. These entries require that the steps or operations by which a given result or end is attained be described. Here is a sample entry: 'How'd you get 72 (for an answer)?'. It is expected that the student tell the steps he took to obtain this answer.

12.5 Teleological Explaining. This type of entry contains descriptions of actions, decisions, states of affairs, or the worth of things. It requires that these be accounted for or justified by reference to purposes, functions, or goals. An entry of this sort is: 'Why are you doing those problems?'. Now, the consequent to be explained is "doing those problems". The explanation consists in giving a purpose, say, to satisfy an assignment.

12.6 Normative Explaining. Entries of this type do either of two things. First, they may mention or assume a decision, judgment, or state of knowing and require that it be justified by citing a definition or characteristic or both. Here is an example: 'Why do we call them (animals between vertebrates and invertebrates) the Chordata animal group?'. The consequent is the underscored part of the question. To give the antecedent in this case is to cite a definition of the chordata phylum and to point out that the animals in question have the characteristics called for by the definition.

Second, members of this group of entries cite actions, decisions, or choices (either made or to be made) and require that rules be given as reasons for the decisions, choices, etc. Consider this example: 'Why do we use shorter (in comparing two pencils as to length)?'. The consequent to be explained is "we use shorter". The antecedent demanded by the question consists of a rule prescribing the use of "shorter" in such cases. Entries of this type usually call for grammatical or mathematical rules.

13. Directing and Managing Classroom. Many questions asked by teachers have little or no logical significance. They are designed, not to evoke thought, but to keep the classroom activities moving along. Questions of this sort belong in this category.

4. Notes on the Logic of the Categories

Five of our categories will be readily recognized as logical categories. Definition is a standard topic of logic; so are designating, classifying, conditional inference, and substituting. The first two of these are related directly to the questions of linguistic clarity. These operations are used as we seek to formulate the rules by which words are used and to specify the referents of our terms. Classification is of course a fundamental topic in logic. Its relation to definition and categorical reasoning is too well known for comment. What we here call conditional inference is usually treated under the heading of conditional argument or hypothetical reasoning. Substitution is treated in elementary logic in connection with the subject of definition, as in the substitution of forms. In symbolic logic it is a primary operation, the exchange of one expression for another or its replacement by another being subject to rules of substitution.

Explaining, valuating, and comparing and contrasting are not readily recognized as logical categories. Explaining has greater claim to such a status than the other two terms, using the simple rule of topics treated in elementary works on logic. Explanation is dealt with in a number of general logics, at least in the limited sense of explanation by subsumption under a general rule of the particular instance to be explained. But other forms of explanation are treated mainly in more general works in philosophy. Valuating, as everyone knows, is a highly controversial subject in both philosophy and Education. Some authorities hold that valuation is merely an expression of approval or disapproval of one's likes and dislikes. From this standpoint valuation has no logical status whatever, it being merely a psychological disposition called attitude or what-not. In sharp contrast is the view that valuation is in principle the same as a factual claim, it being redeemable by reason and observation as becomes any empirical assertion. Valuation would in this case be subject to the rules of logic, even though it would not itself be a category of logic. Between these two extremes, a number of other positions are to be found with respect to the cognitive and logical status of valuation. It is clear from transcripts of classroom discourse that some valuations are expressed as likes and dislikes, others as justified preferences, and still others as matters of fact. Turning now to comparison and contrast, we come upon primitive operations, so primitive in fact that they are usually taken for granted in works on logic, even though they are involved in classification, definition, and in other operations requiring distinctions among either concrete or abstract objects. At the psychological levels they are acts of discrimination. From a logical standpoint, they can be treated in terms of the logical relations of symmetry and transitivity.

The remaining categories in our list are not as distinctly logical as those we have just discussed. The category of Directing and Managing Classroom is clearly non-logical. It is included for the simple reason that all entries were to be classified whether they were logical or not, and, since entries having to do with classroom mechanics were of little or no logical significance, a non-logical category was included in our list. Stating and reporting as well as Opining are not treated in general works on logic. They are logically significant, however, in the sense that whatever is stated or reported to be the case, or asserted as an opinion, can be tested as to its truth. However, it should be remarked that some opinions are apparently beyond the pale of empirical test. Those opinions which consist in contrary to fact claims are of this sort. For example, the opinion that Napoleon would not have lost the battle of Waterloo had he not made the Moscow campaign is one for which no direct empirical evidence can be adduced. Such opinions may be useful in discussion, and even in scientific reasoning, but they remain as unsubstantiated claims.

Finally, we consider the category of describing. This category proved to be very ambiguous. This fact is to be attributed to a number of things. Perhaps the most significant of these is the fact that description, as it is used in philosophic literature, suffers from a variety of uses. Thus we say of a scientific law that it is a description of nature, of the expression "Socrates is a man" that it is a description of Socrates, of the narrative of a battle that it is a description, and so on. Russell's distinction between ambiguous and definite description appeared at first to be useful for our purposes. Thus, according to Russell, to say that Socrates is a man is ambiguous in the sense that he could be any man. Definite description, on the other hand, would be one which singled Socrates out and distinguished him from other men. Thus Socrates was the man who taught Plato and died in Athens from drinking hemlock in 399 B.C., would be a unique description. There is one and only one such man called Socrates. We attempted to use this precise meaning of description, but the ambiguity of the entries precluded this possibility. We thus turned to a less rigorous definition of description, reducing its meaning almost to the level of ordinary usage.

From the foregoing discussion it can be seen that the present set of categories may be considered defective in at least two ways. For one thing, the categories are of different orders with regard to their logical significance. Some of them represent schematic operations. For example, defining involves the giving of a class and the characteristics which distinguish within the class that which is being defined. To this operation certain rules can be applied to decide whether or not the operation was properly performed. Opining, on the other hand, seems to involve no such operation. It is merely an expression of belief. Logical rules are applicable to the operations of testing a belief expressed as an opinion, but they cannot be applied to the expression of the opinion itself. Also, as we have noted, the category of classroom management is altogether non-logical.

For another thing, the categories overlap. Description seems to spread to almost every category. We explain by describing, as in sequent and mechanical explanation. We describe when we tell the similarities and differences among objects or when we classify things. We give valuations when we utter certain opinions and we express opinions when we make certain valuations. These few instances are perhaps sufficient to indicate some of the problems which remain to be dealt with as our work moves in the direction of more adequate ordering of the categories and more rigorous definitions of them.

CHAPTER VI

CRITERIA FOR CLASSIFYING ENTRIES

We turn now to the question of how entries by which episodes are to be classified are to be placed in the categories set forth in the preceding chapter. To classify entries it is necessary to satisfy two conditions: first, we must formulate criteria by which to decide the category into which any entry is to be placed; and, second, these criteria must be tested for the degree of consistency with which different observers, using these criteria, put the same entries into the same categories.

1. How the Criteria Were Formulated

We developed the criteria from a set of entries taken from a sample of transcripts covering all the subject-matter fields represented by our complete set of tapes. There were approximately 1400 entries in our sample set. Each entry was typed on a strip of paper for convenience in handling.

Two investigators working separately developed the criteria. They followed the rough procedure of trial and error. One investigator worked through part of the sample set of entries, putting each entry into the category deemed to be appropriate. The gross experience of classifying entries in this way led to the formulation of a few rules. As other entries were classified, additional rules emerged. When this investigator had worked through the entire set of entries, the rules he had formulated were given to the second investigator who then attempted to classify the entries by the rules. The difficulties encountered by the second investigator were discussed and the tentative criteria were modified to obviate the troubles. By this to and fro exchange between the two workers, the criteria were put into semifinal form. The two investigators, working individually, now classified the entire sample of entries. They then compared their classifications, noting the agreements and disagreements, and making such changes as their deliberations called for. The criteria thus revised were used as the working set. This working set is reproduced in the next section.

2. The Criteria

1. Defining

1.1 Criteria and Examples

1.11 A term is given and the definition, meaning, use, or what we understand by the term is explicitly asked for.

- 1.111 What does the word "pons" mean?
- 1.112 What's the definition of felony?
- 1.113 Couldn't "well" be used as a judgment, exclamation?
- 1.114 How would you define that (crime)?

1.12 A term is given, and the entry asks (implicitly) what the referent of the term is.

- 1.121 What is the mid-brain?
- 1.122 What is a cablegram?
- 1.123 What is nationalism?

1.13 The name of a person or any object, place, or event having a grammatically proper name is given, and the entry asks who he (she) is (was) or what it is.

- 1.131 Who was John Hay?
- 1.132 Who is John Adams?
- 1.133 What is the Monroe Doctrine?

1.14 A term or expression is given, and the entry asks for a symbol or other expression that takes the place of it. This type of definition involves a shorthand expression. The shorthand expression is given, and the longer expression is asked for, or vice versa.

1.141 What is the symbol for time?

1.142 S means what?

1.143 Is h the height?

1.144 p means what in the formula?

2. Describing

2.1 Criteria and Examples

2.11 The entry asks what is (was) happening, what happened, has been happening, had happened, etc.

2.111 What's happening in South Africa now?

2.112 What happened with the Independence?

2.12 The entry asks for an indefinite description - can you tell us about so and so, what can you tell us about so and so, what about so and so, how about so and so.

2.121 Can you tell us anything about the schools of New Zealand?

2.122 What can you tell us about the amoeba?

2.123 What else can you tell us about the nematode?

2.124 What about the skin of the frog?

2.125 How about the surface of the moon?

2.126 Anyone add anything to that (discussion of boron)?

2.13 The entry asks about the purpose, aim, or function of something.

2.131 What else does the pupil of the eye regulate?

2.132 What are some of the functions of the liver?

2.133 What is the aim of the triple A?

2.134 What are nouns supposed to do?

2.135 What does the governor on a motor do?

2.136 What are we supposed to find out?

2.14 The entry asks explicitly what the relationship is between two or more things. The word "relationship", "related", or "relations" appears in the question.

2.141 What is the relationship between the big dipper and the north star?

2.142 How is spelling ability related to reading ability?

2.15 The entry asks what something (object, word, institution, etc.) is used for, or the uses of it, etc.

2.151 What is another use for hydrogen?

2.152 What is police power used for?

2.153 What are some of the uses of marble?

2.16 The entry asks what something (individual, object, institution, etc.) did, was doing, what was done with something, what they did, etc. (If the question asks the person addressed what he does, did, has done, etc., it should be placed in 2.27 rather than here.)

2.161 What had Wilson succeeded in doing before the war broke out?

2.162 Did the U. S. go in and take the territory?

2.163 What did they do with it (treaty agreement)?

2.17 The entry asks about the form, appearance, composition, etc., of something.

2.171 What does a landau look like?

2.172 How about the form of a lamella?

2.173 What is lampas made of?

2.174 What was that scene like?

2.18 The entry asks what was found out by someone who is not a member of the class. (If the question asks the person addressed what he found out, e.g. 'What did you find out,' etc., it belongs in 2.29.)

2.181 What did Darwin find out about the emotions of man?

2.182 What did the main character discover about himself?

2.19 The entry asks what the properties or characteristics of something are; whether something ever had or now has a particular property.

2.191 Anyone have any other properties of chlorine?

2.192 What are some of the physical and chemical properties of iron?

2.193 What are some of the characteristics of John Marin's paintings?

2.194 Did man ever have scales?

2.195 What else is characteristic of the reptile?

2.196 What do the whales have?

2.20 The entry asks what is the problem of something (animal, person, nation, etc.)

2.201 What was one of the first problems faced by the Constitutional Convention?

2.202 What are the problems of the polar bear?

2.203 Can you name one of the problems Washington faced as a general?

2.21 The entry asks where - where something comes from, where it is located, where it gets its name, etc., where something was done, where it is found, and the like. (Questions which ask where something was discussed or talked about in the course belong in 2.28.)

2.211 Where are the kidneys located?

2.212 Where did Booker T. Washington get his first name?

2.213 He wasn't born in Salem, Illinois, was he?

2.214 Where is Singapore?

2.22 The entry asks when - when something happened, what time it occurred, etc.

2.221 Do you know what time it was (that Cleveland served as President)?

2.222 When was the Spanish Armada destroyed?

2.23 The entry asks explicitly for a description. The word "describe" is used in the entry.

2.231 Will you describe the way the main character looked?

2.232 How would you describe the landing of a plane?

2.24 The entry asks how many there is of something, or how long (in a temporal sense or otherwise) something is, and for a numerical value of the area, volume, valence, etc., of a particular something. All questions asking for numerical value of variables or constants go here.

2.241 How many bones are there in the human skeleton?

2.242 How long did the Civil War last?

2.243 The area of the triangle is?

2.244 The sum of the squares equals what amount?

2.245 What is the valence of the (SO_4) radical?

2.246 What is the altitude in this triangle?

2.247 What is the size of that angle?

2.25 The entry asks how the person addressed or the class at large feels (felt), whether or what he (it) understands, what he (it) thinks of, etc.

2.251 Did you like that piece of music?

2.252 Do you ever feel moody?

2.253 Understand (an explanation in a physics problem)?

2.26 The entry asks either the person addressed or the entire class what he (it) notices, has seen or heard, or whether he (it) has read about something, what he (it) learned, etc.

2.261 What do you notice about the fish in the aquarium?

2.262 Have you ever heard of the snowbird?

2.27 The entry asks the person addressed what he does, has done, what he has or has had.

2.271 Do you have headaches?

2.272 Did you ever handle snakes?

2.28 The entry asks what the source of information is, (not what's contained in the source), where (but not what) something was talked about, where one found out about something, etc.

2.281 Where did you learn about the principle of flotation?

2.282 Were you there when the speaker told about the origin of coal?

2.283 What page is that on?

2.29 The entry asks the person addressed what he found out about something. (If the entry asks what was found out by someone who is not a member of the class, it belongs in 2.18.)

2.291 What did you find out about race horses?

2.292 What have you discovered about the way to extract potassium?

2.30 The entry asks what to do, or what the means are, to reach or attain certain ends.

2.301 What does one do to grow unblemished peaches?

2.302 What must we do to find the volume of a cylinder?

2.31 The entry asks whether something exists.

2.311 Does Japan have a king?

2.312 Are there vestigial structures in the human body?

2.32 The entry asks whether (but not by what means) something is changing, has changed, etc.

2.321 Is the earth's surface becoming smaller?

3. Designating

3.1 Criteria and Examples

3.11 The entry may ask for any one of the following: for an example or instance, for either one or some members of a set of things, for something else about an object (abstract or concrete) already introduced, for other groups or types of things than those already mentioned. Entries of this type usually contain such words as "example", "one", "some", "a" or "an", "another", "other", "what else". They never ask, explicitly or implicitly, for all members or for a particular member of a set of things. (Entries which ask for examples or instances of reasons, beliefs, agreements, and the like are to be placed in 4 rather than here.)

3.111 Give me another type of highway accident.

3.112 What is an example of words spelled alike but pronounced differently?

3.113 Can you think of any other types of government?

3.114 Give me a substance that dissolves in water.

3.115 Name some words which have the same form for both plural and singular.

3.116 What else is heavily restricted by tariff?

3.12 The entry gives a set or class of things, and asks that all members of it be named, listed, or enumerated. This type of question differs from those in 3.11 in that it requires implicitly or explicitly, that all rather than some members of the class be named. (Questions which ask for the mere listing of reasons, beliefs, etc., should be placed in 4 rather than here.)

3.121 What are the parts of speech?

3.122 Which states did Wilson speak in during his first campaign?

3.123 What are the different parts of the heart?

3.124 Name the components in that diagram.

3.125 What are the races of man?

3.13 The entry gives a particular class or group of things, or else a particular object (concrete or abstract), such as a word, a line (in a geometrical figure), a biological entity, and it requires that these be specified by name.

3.131 What would you find next to the nucleus of the cell?

3.132 What is the longest bone in the human body?

3.133 Which part of the brain is the lowest?

3.134 Which word is to be modified?

3.14 The entry describes or suggests a particular person, a character, social group, institution, and it requires that these be identified by name. (Same as 3.13 except that persons, social groups, and institutions are involved.)

3.141 Who made the "Cross of Gold" speech?

3.142 What is the lower house in New Zealand?

3.143 Whom did they select for the campaign manager?

3.144 Which group of people supported the revolution?

3.15 The entry asks explicitly for the name of something or for what it is called.

3.151 Do you know what "strike breakers" are called?

3.152 What was the name of the man who nominated Harding?

3.153 What do we call animals which suckle their young?

3.154 Can you recall the name of the hero (in the play)?

3.155 What is the technical name for the junco?

4. Stating

4.1 Criteria and Examples

4.11 The entry asks any one of the following: What is (was) deduced, inferred, concluded, decided, recommended, believed, or what are the issues, criticisms, obligations, etc.

4.111 What criticism did they make of Harding's administration?

4.112 Does anyone recall the decision reached at the conference?

4.113 Our conclusion is what?

4.114 What were Cleveland's obligations on assuming office the second time?

4.12 The entry asks implicitly or explicitly for a formula, equation, rules, (theorems, principles, etc.) when not used to explain.

4.121 Do figures have to be the same size to be congruent?

4.122 What is the formula for the area of a square?

4.123 Newton's law of gravity--what is it?

4.124 The area of a triangle must always be what?

4.13 The entry asks for one or more steps or phases in the solving of a problem.

4.131 What is the first step in the proof?

4.132 What is the next thing that comes to your mind (in solving a problem)?

4.14 The entry asks the person addressed what answer (solution) he got, whether he has the answer or not, etc.

4.141 What (solution) have you got?

4.142 Did you get the answer?

4.143 Which answer did you get?

4.15 The entry asks or directs the students to practice a given exercise (either repetitive or involving the use of principles to make choices among alternatives) or to give corrections of errors made by fellow students. (Invitations or commands to do or to carry on discussions or to work on problems belong in 13.13 rather than here.)

4.151 Give us a correction on that.

4.152 Read these sentences and use the correct verb form in the blanks.

4.153 Use this word (swiftly) in a sentence.

4.154 Give me a comparison of these two colors.

5. Reporting

5.1 Criteria and Examples

5.11 The entry asks for account of what is said about something in a document, book, text, etc., or what is shown on TV, etc.

5.111 Did the text say anything about Hamilton's economic plan?

5.112 What did the treaty say about the rights of the Indians?

5.12 The entry asks that the information given in the text, etc., about a problem be stated.

5.121 Tell us what is given.

5.122 What do we have given?

5.13 The entry asks for a summary or a review, for what an individual recalls about the class work, and the like.

5.131 Sum up what we have been doing.

5.132 What did we say about the public control of business?

5.133 What do you remember about Jackson's attitude toward the bank?

6. Substituting

6.1 Criteria and Examples

6.11 The entry asks or directs the student to multiply, substitute, etc.

6.111 Multiply it for him.

6.112 Substitute for us in this equation.

6.12 The entry asks or directs the students to simplify an expression, etc.

6.121 Simplify it for us.

7. Valuating

Perhaps the most reliable (but not completely dependable) verbal cue to these entries is the occurrence of such words as "bad", "good", "mistake", "right", "safe", "true", "freedom", "strong", "new".

7.1 Criteria and Examples

7.11 The entry asks whether the action (decision, feeling, etc.) of an individual or group is right, just, democratic, strong, etc.

7.111 Do you think President Truman did right when he removed General MacArthur?

7.112 Was the sit-down strike a sensible thing?

7.12 The entry asks whether an institution, law, social policy, or practice is right, just, good, bad, etc.

7.121 Is a law requiring a person to belong to a union bad?

7.122 Didn't the anti-trust legislation rob people of their rights?

7.123 Do you think the parliamentary system is very good in emergencies?

7.13 The entry asks whether a physical or biological object or characteristic is important, valuable, etc.

7.131 Is the fact that man has the thumb very important?

7.132 Do you think that silicon is very valuable to American industries?

7.14 The entry asks whether an operation is satisfactory, a bit of evidence is sufficient or adequate, or an assumption, statement, conclusion, etc. is true, safe, sufficient, and the like.

7.141 Would that be a satisfactory way to measure humidity?

7.142 Is that a safe argument?

7.143 What about what the newspaper said on toll roads--is that true?

8. Opining

8.1 Criteria and Examples

8.11 The entry asks for an opinion or belief about the disposition or feeling of an historical individual or social group toward something which happened or existed after his (their) time.

8.111 Would Hamilton favor legislation to help the farmer today?

8.112 Do you think Napoleon would favor present French foreign policies?

8.12 The entry asks for an opinion about how an historical individual or group felt or thought about something which happened or existed during his (their) time.

8.121 How do you think the Romans felt about foreign conquests?

8.13 The entry asks for an opinion about what an individual or group will say or do in the future (immediate or remote) about something.

8.131 What will the next generation say about the administration of President Truman?

8.14 The entry asks for an opinion about whether something is possible or not.

8.141 Can a snake do that - climb a tree?

8.142 Do you think you can learn to do that - type 100 words a minute?

8.143 Can one also use '$a = s^2$?'

8.15 The entry asks what a person or group lacks, what would benefit him (them), what you (they) would do about something, and the like.

8.151 What do you think the school needs most of all?

8.152 Would an income tax benefit the poor?

8.16 The entry asks for an opinion about whether something is necessary.

8.161 Did President Roosevelt have to declare the bank holiday to save the country from complete disaster?

8.162 Does a fish have to live in water?

9. Classifying

The most (but not completely) dependable verbal cue for the identification of these questions is the occurrence in the question of such words as "group", "type", "class", "classification", "kind", "sort", and other expressions equivalent to these.

9.1 Criteria and Examples

9.11 An instance (either a particular or subclass) is given, and the type (class, kind, etc.) which it belongs to is asked for.

9.111 Is it ("there") usually an adjective?

9.112 What type of reaction is this: exothermic reaction?

9.113 What group (of animals) does the starfish belong to?

9.114 Would this ($NaOH$) be an organic compound or inorganic?

10. Comparing and Contrasting

The most (though not entirely) dependable verbal earmark of these questions is the presence of such expressions as "difference between (in, among)", "differ", "differ from", "be different", "compare", "like", "correspond".

10.1 Criteria and Examples

10.11 Two or more things are specified, and the differences or similarities between them are to be supplied.

10.111 What is the difference between organic and inorganic (compounds)?

10.112 What do they (words on board) have in common?

10.113 How does that (murder) differ from culpable homicide?

10.114 Is there any difference in the tongue of the lizard and the salamander?

10.12 Two or more objects are mentioned, and their differences or similarities with respect to a specified characteristic or a component part is required.

10.121 Where do we have a big difference in these animals (frogs and salamanders)?

10.122 Can you tell the difference between SO_2 and H_2S as far as the odor is concerned?

10.123 What is the difference in these two (axon and dendron) in their structure?

10.13 An object is specified, and something similar to or different from it is to be supplied.

10.131 What would it (nervous system) correspond to in a building?

10.132 What's the opposite of the word "dorsal"?

10.14 Two or more things are supplied, and the entry asks whether the things are alike, the same, etc.

10.141 Is the state the same thing as the government?

10.142 Would a quail be something like a partridge?

11. Conditional Inferring

11.1 Criteria and Examples

11.11 The antecedent gives an objective condition in which a person finds himself, and the question asks what comes to mind, how one would feel, etc.

11.111 What is the one wish that goes through your mind (when you are in a situation that is utterly hopeless)?

11.12 The antecedent mentions or suggests a psychological state (need, want, feeling, use of mind or nervous system, know, perceive, etc.), and the question asks what is to be done, what has to be done, what is going to be done, what you would do, what the result would be, what would be possible, etc.

11.121 If you need a modifier to modify a verb, which one (modifier) are you going to take?

11.122 If you tried to stop thinking, couldn't you?

11.123 If you saw it (cerebrum) from say, the back, what would it appear to be like?

11.13 The antecedent gives a condition, and the question uses such expressions as what happens, what might happen, etc., to ask for the consequent.

11.131 What happens when you are hypnotized?

11.14 The antecedent gives a condition (action, decision, social practice, etc.), and the question asks for an effect which is good, bad, negative; or the question may simply ask for a value judgment, as in (11.142) below.

11.141 What are some bad things (which result to the colonies by colonization)?

11.142 Is he a good judge if he sentences the man to hanging?

11.15 The antecedent gives a condition, and the question uses such expressions as "effect", "affect", "influence", "result", "get", "gain", "give", "bring", to ask for the consequent. Unlike 11.14 above, a descriptive rather than a value consequent is asked for.

11.151 What else (did the mother country get from having colonies)?

11.152 Something else (which results to the colonies by colonization)?

11.16 The antecedent gives a condition, and the question uses the expressional form 'What is x...?' to ask for the consequent.

11.161 If they're (two lines) parallel, what is the altitude of the two triangles?

11.162 What is the side of the square, if its diagonal is 10?

11.17 The antecedent suggests an operation (mathematical, physical, etc.), and the question asks for the result, outcome, etc.

11.171 If you put gold in aqua regia, what becomes of the gold?

11.172 What would result if we were to add this weighter to the beam?

11.18 The antecedent gives a condition (mathematical, physical, etc.) and the question uses such expressions as "how much", "how long", "how many", and other quantitative expressions to ask for the consequent.

11.181 If you had a car and go fifty miles an hour for three hours, well, how far do you go?

11.182 If the base is CD, we know its (parallelogram's) here is how long?

11.19 The antecedent gives a condition, and the consequent asks how something may be identified, explained, classified, defined, called, etc.

11.191 If it (fish's eye) is not compound, what kind is it?

11.192 When we use this term (friction) in physics, how do we define it?

11.20 The antecedent tells what an object or substance is, and the question asks what it would do, etc.

11.201 If it's an electrovalent compound, then it would?

12. Explaining

Entries beginning with How...? and Why...? usually are explanation entries. So, these stems are fairly reliable cues. But if these cues alone are used, many explanation entries will be overlooked. For some of them have quite different stems, such as What...? Is...? Can...? and Would...? The following is a typical case of entries having such stems: 'What else happened that helped business?' The student is asked to cite the event that supposedly "helped business". In general, entries asking for evidence (laws, rules, facts) to account for something are classified under explanation.

12.1 Mechanical Explaining

12.11 Criteria and Examples

12.111 A physical or biological operation or process performed by, or occurring in, an animal (person) or plant is given, and the entry asks either how or why it occurs or is performed.

12.1111 How does a chicken digest its food?

12.1112 Why is it that a frog can live under the water?

12.112 The entry suggests a physical or biological outcome, result, process, or operation that is prevented or kept as it is, and the entry asks what it is that prevents it, etc.

12.1121 What keeps the body temperature from rising on a hot day?

12.2 Causal Explaining

12.21 Criteria and Examples

12.211 The entry gives a psychological state or attitude (actual or claimed) of a person or group, and asks why it occurs or what brings it about.

12.2111 Why do you suppose the attitude of the President was against the Suez invasion?

12.2112 Why was the main character often unhappy?

12.212 The entry suggests a possible cause of an act (or result), and asks how the suggested cause leads to the given act or outcome.

12.2121 How does socio-economic level lead a person to engage in delinquent activities?

12.213 The entry gives a social or political condition or action, and asks how or why it occurs or has occurred, or what condition causes it.

12.2131 Why did the Democratic party lose the 1952 election?

12.2132 What is the cause of juvenile delinquency?

12.214 A physical effect or outcome (organic or inorganic) is mentioned or described, and the entry asks why it occurs, or what produces it, or what amount of something will produce it.

12.2141 Why does iron rust?

12.2142 Why does a free floating magnet point to the north?

12.215 A state of affairs (organic or inorganic) is described, and the entry asks why or how it is the case.

12.2151 Why is the yellow pine found in the deep south rather than farther north?

12.3 Sequent Explaining

12.31 Criteria and Examples

12.311 The entry states something that happened, and it asks how it happened. Usually the word "happen" occurs in the question and the question usually begins with "How".

12.3111 How did Coolidge happen to become president?

12.3112 How is it that Jackson got the name of Stonewall?

12.312 The entry describes a state of affairs, and asks what some person did that brought it about. These entries usually begin with "What".

12.3121 What had Jackson done that turned the financial interests in the East against him?

12.313 The entry suggests an outcome or result, and asks implicitly what events brought it about. These entries usually begin with "What".

12.3131 What turned the Chamber of Commerce against the NRA?

12.314 The entry states a particular thing that was done by a person(s) other than the one addressed, and asks how it was done.

12.3141 How did he (author of film) show those (ancient fish)?

12.3142 How did Lincoln succeed in winning the nomination?

12.4 Procedural Explaining

12.41 Criteria and Examples

12.411 The entry asks how the person addressed does or did a particular thing.

12.4111 How do you extract it (potassium)?

12.4112 How'd you spell "hydroxide"?

12.412 The entry asks how the person addressed gets or got a particular result.

12.4121 How'd you get the answer to that problem?

12.4122 How do you get that result on those scales?

12.413 The entry asks how the person addressed (or another person or persons) does or did, can (could), or will (would) do a particular thing.

12.4131 How could you prove that the Pilgrims came here for religious freedom?

12.4132 How would you identify an acid?

12.4133 How do they hybridize corn?

12.414 The entry asks how a particular something is done (without regard to time, circumstance, or person).

12.4141 How is sulphur mined?

12.4142 Humidity is measured in what way?

12.4143 "Grandiflora" is spelled in what way?

12.5 Teleological Explaining

12.51 Criteria and Examples

12.511 The entry asks why something is important.

12.5111 Why is the ability to change its color so important to the chameleon?

12.5112 Can you tell us why rapid communication is important to a nation with a large territory?

12.512 The entry asks how or why something (excluding linguistic and mathematical materials) is used.

12.5121 Why is lead pipe used in plumbing?

12.5122 How do the various foundations use their money?

12.513 The entry asks why certain structures (biological, physical, or social) exist, or why they occur or work in a particular way.

12.5131 Why are there three branches in our government?

12.5132 Why do frogs have wrinkled skins?

12.514 The entry asks why a person or group does (did) or would do a particular something.

12.5141 Why would they (Boxers) pick on that particular city?

12.5142 Why did he (Arthur Jarvis) leave it (his writing)?

12.515 The entry asks why a particular situation is a problem.

12.5151 Why are traffic fatalities a problem?

12.6 Normative Explaining

12.61 Criteria and Examples

12.611 The entry asks why something is classified in a particular way, how it is identified, or why it is called what it is called, or it asks for a characteristic which is used to account for something being or becoming a member of a group.

12.6111 Why do we call them (animals between vertebrates and invertebrates) the chordata animal group?

12.6112 Why do we put the gypsy moth under insects?

12.6113 How do we identify spiderwarts?

12.612 The entry asks how we know something.

12.6121 How do you know that sodium chloride should react neutral?

12.6122 How will you know whether to use the definite article here?

12.613 The entry asks for reasons to justify a particular conclusion. The word "reason" appears in the question.

12.6131 For what reason (two sides equal)?

12.6132 What do you have as the reason the two triangles are congruent?

12.614 The entry asks why or how some particular linguistic usage is chosen, decided upon, accepted, etc.

12.6141 Why (do you think the modifier in the sentence should be "positive")?

12.6142 Why do you decide on "rapidly" (as a modifier in a sentence)?

12.6143 How are you going to decide in this case which one (adjective or adverb) you use?

12.615 The entry asks why a given conclusion (explicit or implicit) is the case.

12.6151 Why does angle A equal angle B?

12.6152 Why do you say that we can't use that formula here?

13. Directing and Managing Classroom

13.1 Criteria and Examples

13.11 The entry asks about reports, themes, and papers--when they are to be made or completed, who is to do them, what is the subject of reports, topics, etc.

13.111 Who wants to give a report on the fisheries?

13.112 Let's have your report?

13.113 How about a report on rockets?

13.114 Did you include the north star in your report?

13.115 Do we have anybody who hasn't had a chance to report?

13.116 Would you read your theme?

13.12 The entry asks about problems, topics, outlines and assignments.

13.121 Was this topic in the assignment?

13.122 Are we supposed to continue with these questions?

13.123 Didn't I assign those problems?

13.124 Were we to write the assignment out?

13.13 The entry asks about who had, or who is to do a problem, or it invites someone to handle a problem in class, etc.

13.131 Who has problem No. 4?

13.132 The sixth one (problem in geometry)?

13.133 The next one (problem in physics)?

13.134 Give us that one (problem).

13.135 Number 4, please.

13.14 The entry asks about classroom mechanics--who is to lead discussion, etc.

13.141 Who is to lead the group today?

13.142 Who is to pass out the books today?

13.15 The entry asks about answers to questions--rating of examinations, giving of examinations, etc.

13.151 Is the test worth 100 points?

13.152 How much did you take off?

13.153 What was question 15?

3. Reliability of Criteria

The type of reliability estimate we used to determine the reliability of the criteria was one based on percentage of agreement between independent judges. The experimental phase involved obtaining independent judgments of a sample of entries. The statistical index that we used was a rather simple one involving merely frequencies of agreements and disagreements.

Four judges were used to obtain the independent judgments required for the reliability test. These four judges were graduate students in Education at the University of Illinois. Two were from the educational psychology program and two were from the philosophy of education program.

Two sample sets of entries were used for the purpose of training the judges. The first was an easy set containing about 55 entries. The other set was more difficult and contained about 120 entries.

Before classifying the first set of entries, the judges were given general instructions and a set of general procedures to be followed in classifying the entries. These general procedures are to be found in the Appendix.

After classifying the first set of easy entries independently of each other, the judges met with us to check their agreement and to discuss difficulties they encountered. They then classified the second set of more difficult entries and afterwards met with us again to check their agreement and discuss their problems.

The final set of about 300 entries was then classified by the judges. The entries in this final set were selected randomly from the entries we judged to be in each category. One out of four entries in all but one of the main categories and the subcategories of Designating were selected randomly, and one out of three entries in the subcategories of Defining and Explaining were selected randomly. The one exception was Substituting, which had so few entries that we used them all in the final set.

The agreement on this final set of entries was determined for two pairs of judges (each pair containing one philosophy student and one psychology student). This latter procedure was used to minimize the number of sheer oversights likely to occur--rather than actual misjudgments and misapplications of the criteria. Thus these reliability estimates are for pairs of judges, not single judges. (We feel it best that judges always work in pairs rather than singly on this material, because its complexity tends to result in many "sheer oversights".)

The statistical index used to estimate the reliability of the logical categories was based upon the number of agreements per category between the two pairs of judges. Thus each category has a separate coefficient.

The formula for this index is: $R_i = \frac{A_i}{A_i + D_{1_i} + D_{2_i}}$, where R_i is the estimated reliability for category (or subcategory) i, A_i is the number of agreements in category i, D_{1_i} is the number of entries placed in category i by the first pair of judges but not by the second pair, and D_{2_i} is the number of entries placed in category i by the second pair of judges but not by the first. The estimated reliabilities we obtained are presented in Table 6:1. (The entries designated 1T, 3T, and 12T are for these categories as a whole, i.e. ignoring the subcategory divisions.)

As can be seen, the estimated reliabilities range from 0.00 to 1.00. The median is .67, and the middle 50% of the estimates range from .62 to .84--a fairly high percentage of agreement for the present status of our categories.

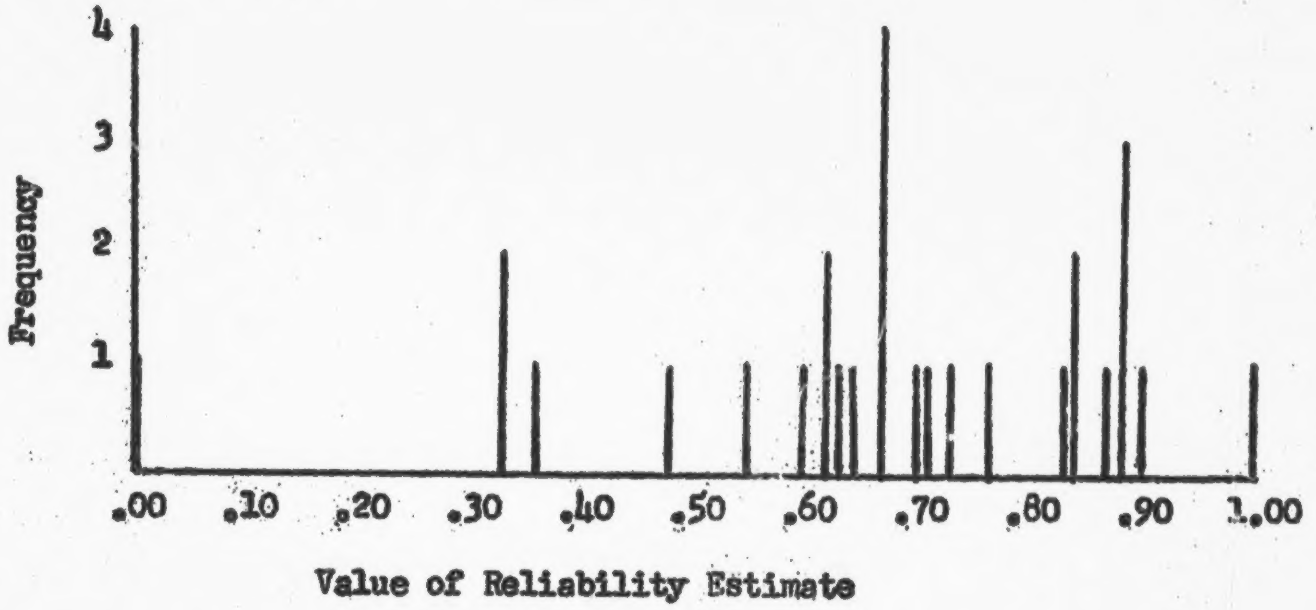
The highest estimated reliabilities are those for categories 3.15, 3.14, 1.11, 1.12, and 6--two subcategories each in Designating and Defining, respectively, and Substituting--; these range from .88 to 1.00. The lowest estimates are those for categories 1.14, 1.13, 5, and 12.3--two subcategories of Defining, Reporting, and an Explaining subcategory--; these range from 0.00 to .36. (The two subcategories 1.14 and 1.13 in Defining had only two entries each, so that the very low estimates for these subcategories--.33 and 0.00, respectively--are undoubtedly due at least in part to sampling error.)

Table 6:1. Reliability estimates for the criteria for the logical categories.

Category	Reliability estimate
1.11	.88
1.12	.88
1.13	.33
1.14	0.00
1T	.84
2	.67
3.11	.64
3.12	.62
3.13	.48
3.14	.90
3.15	1.00
3T	.71
4	.63
5	.33
6	.88
7	.60
8	.73
9	.70
10	.62
11	.67
12.1	.83
12.2	.55
12.3	.36
12.4	.67
12.5	.67
12.6	.76
12T	.84
13	.87

These estimates are shown graphically in Figure 6:1. (Here, e.g., the concentration of the middle estimates is more apparent.)

Figure 6:1 Frequency distribution of reliability estimates.



4. Discussion and Interpretation

On the basis of the work we have done with the categories, it seems apparent that much of the unreliability is due to four somewhat distinct types of difficulties.

One type is overlapping between the categories due to the presence of conflicting cues within the entry, i.e. one part of the entry indicates that it is to be placed within one category and another part of the entry indicates that it is to be placed in an entirely different category. In this type of difficulty, the two separate parts of the entry each by themselves clearly conform to the criteria but conflict as to which category the entry is to be located. Thus disagreement may result from one judge following one cue and another judge following the other cue.

In the second type of difficulty, neither the whole entry nor any significant part of the entry seems to satisfy the criteria of any category. That is to say, the entry does not seem to belong in any category. Judges will disagree as to which of several categories seems to be the most appropriate.

The third type of difficulty is somewhat similar to the first type. It is due to what seems to be a gradual shading of one category into another; e.g., Designating tends to shade into Explanation, the entries seeming to fall along a continuum. Here judges may differ with respect to the point on the "continuum" at which they separate one category from the other.

The fourth type of difficulty arises from the fact that our criteria involve varying levels of inference, some being extremely high in referential distance from the categories and others very low. The criteria for categories 3.15, 1.11, and 1.12 require very little inference. These cases, as already noted, are among the categories high in reliability. It is interesting to note that both verbal and syntactical cues are strong and dependable in the criteria for these categories. The verbal cues "mean" and "define" as well as the syntactical cue 'What is X?' go a long way toward indicating unambiguously the category to which entries exhibiting them belong. On the other hand, some categories are marked by criteria requiring a great amount of inference. A case in point is category 12.2 - Causal Explaining. The criteria in this case are not only vague but they also require the judge to decide whether an entry asks for an explanation of an event, or an explanation of an explanation of an event. Such an interpretation of a criterion, to say the least, involves a high order of reasoning, especially when neither verbal nor syntactical cues are dependable.

At present, we have been unable to develop either completely independent categories or suitable criteria by which to eliminate such difficulties, and it is often not clear as to whether it is the categories or the criteria which needs the most improvement.

CHAPTER VII

ANALYSIS

This chapter will present the results we have obtained up to this point with the logical categories. We will first treat the actual existence and relative frequency of logical operations in the teaching we sampled, and then discuss briefly differences in the occurrence of these categories among schools, grade levels, and content areas--Mathematics, Science, Social Studies, English, and Core Program.

We would like to emphasize that our analysis at this point is of the sheer frequency of the logical demands--as they appear in the entries--made mostly by the teachers on the students. We have not as yet analyzed the sequences or patterns of these demands, nor the ways in which these demands are handled within the bodies of the episodes.

1. The Existence of Logical Operations in Teaching

The purpose of the first phase of our investigation, as indicated in the first chapter, is to determine what logical patterns, if any, are to be found in teaching. Thus, as we discussed in Chapter II, we sampled classes in various content areas at different grade levels, and in schools having various spending patterns, sociocultural environments, and teachers of somewhat different training and background in handling logical matters. We feel that we obtained a fairly representative sample of teaching, but certainly do not claim that we have a random sample of teaching--whatever such a procedure might mean in the context of teaching. (E.g., the reader will recall that we essentially had to use teachers who volunteered their services.)

All the entries in the classes that we taped and were able to use were classified by the two members of the project staff (the principal investigators) who were responsible for developing the categories. Each entry was placed in one and only one category--no disagreements were permitted.

The distribution of entries by the logical categories obtained by this procedure is presented in Table 7:1. The classes have been grouped by subject matter and content area.

It is clear from examining Table 7:1 that several distinct types of logical operations are present in the teaching we have analyzed. The entries clearly are distributed among all the categories--though by no means equally--and there are large numbers of entries in each of what we know to be logically distinct kinds of operations, especially in the categories of Describing, Designating, Explaining, Conditional Inferring, Defining, and Classifying. (We know also from the reliability test reported in Chapter VI that discriminations can be made among these categories fairly consistently.)

Not only do we have clearly different logical operations in the teaching we have studied, but these logical operations differ in the frequency with which they occur. There is no clearly appropriate method for obtaining expected frequencies in each of the categories from our data, nor do we have any defensible rational basis for determining the expected frequencies in each category; therefore we have not employed a significance test to establish that these categories vary in frequency of occurrence. However, it is clear that with such a large number of entries no statistical test is required to support the conclusion that the number of entries varies significantly from one category

Table 7:1. Distribution of Logical Categories by Areas and Subjects.

Area →	Mathematics	Science				Social Studies#				
Subject → Category	Geometry	Physics	Chemistry	Biology	Physiology	U.S. History$_B$	U.S. History$_E$	U.S. History$_A$	World History	Sociology
1. Defining										
1.11	5	2	3	7	11	2	2	0	10	6
1.12	4	1	2	4	14	4	0	0	7	1
1.13	0	0	0	0	0	2	4	0	0	0
1.14	0	10	2	0	1	1	0	0	0	0
1T*	9	13	7	11	26	9	6	0	17	7
2. Describing	97	63	59	110	62	39	82	13	49	35
3. Designating										
3.11	1	0	8	17	11	2	2	0	1	12
3.12	4	1	1	7	6	1	4	0	2	0
3.13	29	7	11	28	27	6	4	1	4	6
3.14	0	0	0	0	14	13	40	8	42	3
3.15	2	2	0	13	6	1	4	0	5	2
3T*	36	10	20	65	64	23	54	9	54	23
4. Stating	58	12	7	5	5	10	16	2	4	4
5. Reporting	6	7	0	9	14	5	6	0	9	13
6. Substituting	4	4	0	0	0	0	0	0	0	2
7. Valuating	2	4	13	1	4	23	4	2	17	7
8. Opining	6	1	5	3	12	43	27	6	5	8
9. Classifying	11	2	6	20	2	2	4	1	2	2
10. Comparing and Contrasting	11	8	5	23	7	7	6	3	6	5
11. Conditional Inferring	37	26	15	22	19	12	9	2	25	16
12. Explaining										
12.1 Mechanical	0	1	0	12	6	0	0	0	0	0
12.2 Causal	0	6	8	11	14	18	7	3	12	9
12.3 Sequent	0	0	0	5	0	9	17	0	4	2
12.4 Procedural	16	3	10	4	4	0	4	0	4	1
12.5 Teleological	2	0	2	4	5	12	6	4	4	4
12.6 Normative	22	0	6	11	1	8	2	0	2	4
12T*	40	10	26	47	30	47	36	7	26	20
13. Directing and Managing Classroom	39	6	17	12	15	49	7	8	29	9
Total number of entries per subject	356	166	180	328	260	269	257	53	243	151

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*Indicates total number of entries in this category.

#Subscripts on the subjects in this area indicate the school in which this class was taped.

Table 7:1. - Continued

Area →	English/			Core Program		
Category / Subject →	English 9	English 11	English 12	Core Program	Number of entries in the category	Percent of total number of entries
1. Defining						
1.11	11	4	6	0	69	2.0
1.12	1	0	6	0	44	1.3
1.13	1	0	3	0	10	0.3
1.14	0	1	0	1	16	0.5
1T*	13	5	15	1	139	4.1
2. Describing	39	40	96	77	861	25.3
3. Designating						
3.11	15	2	0	0	71	2.1
3.12	7	1	0	0	34	1.0
3.13	38	8	9	14	192	5.7
3.14	2	16	8	4	150	4.4
3.15	6	10	3	3	57	1.7
3T*	68	37	20	21	504	14.8
4. Stating	94	2	7	4	230	6.8
5. Reporting	6	0	6	18	99	2.9
6. Substituting	0	0	0	0	10	0.3
7. Valuating	7	19	44	9	156	4.6
8. Opining	3	11	37	12	179	5.3
9. Classifying	21	12	11	7	103	3.0
10. Comparing and Contrasting	8	10	11	2	112	3.3
11. Conditional Inferring	9	17	24	15	248	7.3
12. Explaining						
12.1 Mechanical	0	0	1	1	21	0.6
12.2 Causal	4	2	17	3	114	3.4
12.3 Sequent	2	6	4	0	49	1.4
12.4 Procedural	4	3	4	5	62	1.8
12.5 Teleological	4	6	21	5	79	2.3
12.6 Normative	44	4	8	1	113	3.3
12T*	58	21	55	15	438	12.9
13. Directing and Managing Classroom	38	18	22	49	318	9.4
Total number of entries per subject	364	192	348	230	3397	

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*Indicates total number of entries in this category.

/Subscripts on the subjects in this area indicate the grade level of the class.

to another. Describing, Designating (3T), and Explaining (12T) are the three most frequently occurring operations in that order, with Directing and Managing Classroom and Conditional Inferring and Stating next. The least prevalent operations--aside from the subcategories--seem to be Substituting, Reporting, and Classifying.

We conclude, then, that we have established clearly that there are logical operations in teaching, and furthermore that some of these operations are significantly more prevalent than others, notably those of Describing, Designating, and Explaining, in that order.

2. Logical Operations Within and Among Content Areas

As we examined the results we obtained, as shown in Table 7:1, we observed marked differences from class to class in the frequencies of the logical operations. Although the analysis and interpretation of such differences is not central to our project, and certainly was not included in the original purposes indicated above, we felt that some discussion of these differences might be of interest.

Since our data were not gathered for the purpose of clarifying the relative effects (on the nature and frequency of logical operations) of teachers, subjects, schools, and grade levels, these variables are highly confounded.

The schools differed with respect to money expenditure per student and sociocultural characteristics. Such differences would probably influence the logical demands in the classroom mostly through the medium of the teacher, so that school differences probably reduce to differences in teachers. Thus, for the purposes of this discussion, we can ignore differences between the schools.

We taped classes varying from the ninth to the twelfth grades. This variation in grade level, however, occurs in an age range in which the capacity of the average student to handle logical demands is probably the same from one age level to another. On the basis of a great deal of evidence concerning the development of IQ with maturation, it seems fairly clear that there is little significant increase in the IQ beyond the ninth grade; thus the capacity of the student to handle intellectual operations probably changes very little during the high school years. Also, Piaget's observations have led him to conclude that the handling of propositional logic has been achieved by most normal adolescents by the time they have reached high school. Thus, for the purposes of this discussion, we can ignore not only the differences in schools but the differences in grade levels in so far as maturation of the student is a factor in determining the logical operations at these levels.

However, these assumptions still leave the teacher and subject matter variables confounded. It is unrealistic to assume that either of these variables has little or no effect on the distribution of logical operations. It seems quite plausible to expect that teachers will differ in the extent to which they employ different logical operations in the subject taught. On this matter we can cite relevant evidence from our own tapes. We have two U.S. History classes at the eleventh-grade level that dealt with fairly similar historical periods (labeled in Table 7:1 as U.S. History_B and U.S. History_E). In the U.S. History_B class, there are fewer entries especially in Describing, the 3.14 subcategory of Designating, and Sequent Explaining, but there are more entries in Valuating, Opining, Causal Explaining, and Directing and Managing Classroom. These differences seem to be attributable to the teachers' ways of handling the material, rather than to differences in the subject matter.

It is also quite plausible that there are differences from subject to subject within a content area (e.g., Physics vs. Biology in the Science area), and from one content area to another. Although we realize that the teacher and subject variables are confounded, we shall summarize what seem to be the main differences between the classes within and between the content areas. These should indicate to some extent (and to *what* extent cannot be determined from our data) differences among the subjects and areas with respect to the frequency with which the various logical operations occur.

Differences within the areas. Within both the Mathematics and Core Program areas there is only one subject, thus permitting no comparisons within these areas.

(1) *Science.* Within the Science area, Physiology seems more concerned with Defining (1.12) and Designating (3.13) than the other subjects; Physics is concerned more with the use of symbols (1.14) and Conditional Inferring; Biology and Chemistry seem to deal more with Valuating matters (correctness of evidence, correct answers to problems, etc.) than Physics and Physiology. It is interesting also to note that little difference between the subjects appears in three of the Explaining subcategories (Causal, Sequent, and Teleological); differences do seem to appear in Mechanical Explaining--where Biology is especially high; in Procedural Explaining--where Chemistry is high; and in Normative Explaining--where Biology is especially high, probably because of its concern for justifying classifications.

(2) *Social Studies.* In the Social Studies, Sociology is somewhat high in 3.11, but is low in 3.14, as is U.S. History$_B$. On the other hand, U.S. History$_E$ is high on 3.14, as is World History. U.S. History$_B$ seems quite high on Opining, but World History is low in this category. (U.S. History$_B$

is also very high on Directing and Managing Classroom--this is probably due to the student-centered characteristics of this class.) World History and Sociology are slightly high on Conditional Inferring; U.S. History is somewhat low in this category.

(3) English. In the English courses that we taped, the ninth-grade class seemed to be mainly concerned at the time with the learning and application of rules of grammar, whereas the eleventh- and twelfth-grade courses were occupied at the time with topics in literature, involving discussions of novels, etc. These content differences were reflected in the distribution of entries in the logical categories. The concern with the statement and justification of the use of grammatical rules resulted in many entries in the Stating category and Normative Explaining subcategory, whereas the discussion of characters and issues in the novels resulted in many entries especially in the Opining and Valuating categories.

Differences among areas. Table 7:2 contains the number of entries in each category organized by the area. The main differences among the areas seem to appear in Stating, two Designating subcategories (3.13, 3.14), two Explaining subcategories (Mechanical and Normative), Directing and Managing Classroom, Opining, and Valuating. In these categories, Science is especially low in Stating, 3.14 (a Designating subcategory), Normative Explaining, Opining, Valuating, and Directing and Managing Classroom; it is high in Mechanical Explaining and 3.13 (a Designating subcategory). The pattern for the Social Studies area is exactly the reverse of Science except for Normative Explaining (where both areas are low). Both Mathematics and English are high in Stating and Normative Explaining, whereas English is high and Mathematics low in Opining and Valuating.

Table 7:2. Distribution of Logical Categories by Areas.

Area → Category	Mathematics	Science	Social Studies	English	Core	Number of entries in the category	Per cent of total number of entries
1. Defining							
1.11	5	23	20	21	0	66	2.0
1.12	4	21	12	7	0	44	1.3
1.13	0	0	6	4	0	10	0.3
1.14	0	13	1	1	1	16	0.5
1T*	9	57	39	33	1	139	4.1
2. Describing	97	294	218	175	77	861	25.3
3. Designating							
3.11	1	36	17	17	0	71	2.1
3.12	4	15	7	8	0	34	1.0
3.13	29	73	21	55	14	192	5.7
3.14	0	14	106	26	4	150	4.4
3.15	2	21	12	19	3	57	1.7
3T*	36	159	163	125	21	504	14.8
4. Stating	58	29	36	103	4	230	6.8
5. Reporting	6	30	33	12	18	99	2.9
6. Substituting	4	4	2	0	0	10	0.3
7. Valuating	2	22	53	70	9	156	4.6
8. Opining	6	21	89	51	12	179	5.3
9. Classifying	11	30	11	44	7	103	3.0
10. Comparing and Contrasting	11	43	27	29	2	112	3.3
11. Conditional Inferring	37	82	64	50	15	248	7.3
12. Explaining							
12.1 Mechanical	0	19	0	1	1	21	0.6
12.2 Causal	0	39	49	23	3	114	3.4
12.3 Sequent	16	5	32	12	0	49	1.4
12.4 Procedural	2	21	9	11	5	62	1.8
12.5 Teleological	22	11	30	31	5	79	2.3
12.6 Normative	40	18	16	56	1	113	3.3
12T*	39	113	136	134	15	438	12.9
13. Directing and Managing Classroom		50	102	78	49	318	9.4
Total number of entries in area	356	934	973	904	230	3397	

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*Indicates total number of entries in this category.

We may conclude tentatively from this brief discussion, then, that it seems likely that differences may exist in the extent to which the logical operations are employed from teacher to teacher, and from area to area. Adequate answers as to what this extent is, however, cannot be determined from our data, but await further studies designed more specifically to investigate these matters.

APPENDIX

Procedures for Classifying Entries

1. Definitions:

Entries are utterances which trigger classroom discussion. They are usually questions, though many entries are declarative statements, commands, invitations, etc. The question-type entries vary in form. Some are straight interrogations. Others are incomplete, completion, and rhetorical-type questions.

2. Working Procedures:

It is suggested that the following steps be taken in classifying entries. Items in Step B may be taken concurrently rather than in the order listed.

A. Study the categories and criteria until you have acquired a working knowledge of them.

B. First, make a rapid and rough distribution of the entries by main categories, giving no attention at this point to the sub-categories. Let the refining process come later. The following hints may be helpful.

1) Put all How...? and Why...? entries in an Explaining pile. A few of these questions will not belong here, but they can be identified later.

2) Sort all entries containing the words "define", "mean", "meaning", into the Defining pile. Questions of the form 'What is X?' belong here also.

3) Entries containing such words as "type", "class", "group", "kind", "sort", should be thrown into the Classifying group. Not all of these belong here, but they can be sorted out later.

4) Questions using the words "differ", "difference", "compare", "correspond", "same", and comparable words should be put into the Comparing-Contrasting group.

5) Entries about formulas should be put into the Stating group.

6) All entries using such terms as "right", "good", "justice", and other similar words should be placed in the Valuating category. Some of these may not belong here, but they can be sorted out later.

7) Put all entries about assignments, examinations, classroom operation, and the like in the Managing Classroom category.

8) All entries beginning with "If..." should be placed in the Conditional Inferring group. Some of these will belong in the Managing Classroom group and can be placed there later.

9) Entries involving use of such words as "example", "instance", etc. should be placed in the Designating category.

10) You now have a residual group of entries consisting largely of those which make up the Describing, Designating, Reporting, and Stating categories.

C. You are now ready to begin the refining process. Consider the entries, one by one, in each of these roughly classified piles. As you examine an entry carefully, decide which of the subclasses of the main category it belongs to. If it obviously belongs to none of the subclasses, it should be thrown into a residual group unless it occurs to you to place it in another category. In this phase of the work, it is especially important that you review the categories, criteria, and examples from time to time, especially at points where the classification of an entry is proving difficult.

D. After you have worked through all main categories, placing entries into their subclasses, classify all entries in your residual group. There is no miscellaneous category. All entries must be placed into one or another of the categories provided.

3. Procedural Rules:

   a. The Classroom Management category takes precedence over all other categories. For example, If...then...? entries and How...? and Why...? entries which have to do with the management and operation of the classroom are to be put into the Managing Classroom category, even though their form indicates that they should be placed in Conditional Inferring and Explaining groups.

   b. Except for the Managing Classroom category, the Conditional Inferring category takes precedence over all other categories. Entries which require definitions, explanations, value judgments, or what-not should be placed under Conditional Inferring when they contain a statement of conditions. Sometimes the conditions are in the last part of a sentence rather than in the first, for example, 'How do we explain commerce, if we must describe the class it belongs to?' The entry asks for an explanation. But the conditional clause places it in the Conditional Inferring category.

   c. Ordinarily such expressions as "Do you remember", "Can you name", "Do you know", and "Will you" are to be interpreted as stylistic elements in entries rather than as substantive elements. However, this is not always the case. A criterion for classifying an entry may have reference to the person addressed by the entry, for example, 'Did you ever handle snakes?' In this case the expression "Did you" is a substantive part of the question. This may also be the case when the entry asks for an opinion, for example, 'How do you think the Romans felt about foreign conquests?' There is no general rule for telling when these expressions are stylistic or substantive. You will have to depend upon intuition and your sense of context.